A
SHORT HISTORY
of
STEREOTYPING

by
Geo. A. Kubler

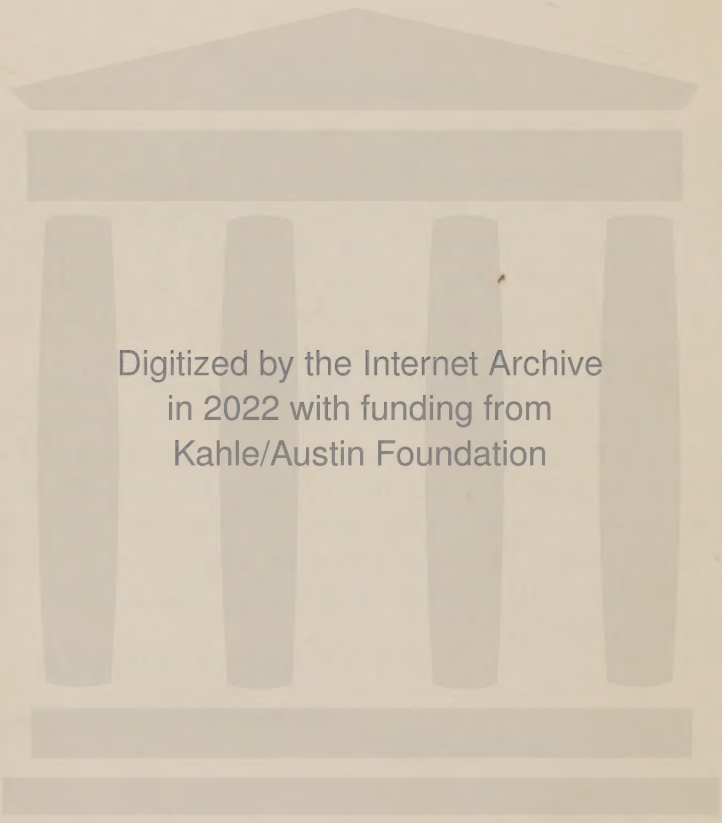
FOREWORD

In offering this little book on Stereotyping to my friends, the Master Stereotypers of America, I do not make any claim for originality. I undertook this task of recording and compiling a sequence of historical and mechanical facts pertaining to the art of stereotyping in order to render the reader conversant with the origin and development of that art to which he is devoting his time, energy and skill.

If this booklet will serve to only one purpose, namely to instill in the American stereotyper the conviction that sterotyping is an ART, born thru centuries of hard, unceasing toil on the part of eminent men and that in doing his daily bit, he is carrying on the traditions of a craft, and thus take additional pride in his daily task, I will feel most amply repaid for the time and labor I have spent in gathering the material contained in this booklet.

GEO. A. KUBLER,
President of the
Certified Dry Mat Corporation.

New York City, March, 1927.



Chapter One

ORIGIN AND DEVELOPMENT OF THE ART OF PRINTING

THE invention of stereotyping was one of the advance steps in printing. It, therefore, seems that a few words dealing with the origin and development of the art of printing, before entering upon the data pertaining to stereotyping proper, will be of interest.

There are, in the history of human intellect, three fundamental stages, and each one presents a tremendous advance over the preceding stage: Speaking, Writing, Printing. Through the gradual progress made by means of speaking, writing and printing, man became more and more qualified for that which is his particular privilege and which is the fundamental condition of his superiority, namely for the communication of thought.

Printing is the art of reproducing a written thought, set up with the aid of movable, mechanically multiplied types, applying ink to this set up form of type, and making therefrom an indefinite number of impressions on a press.

It is difficult to state at what period of time the germ of the art of printing did not exist; some forms of printing were practised at the most remote periods of antiquity. One of the earliest methods was sculpting of pictures and characters on skins, barks of trees, shoulder bones of sheep, shells. Another method was the pressure of engraved seals or signets into gold, wax, or other soft substances. It is also probable that the first step in the art was carried to such perfection by the Assyrians that they produced clay or brick books. Many centuries ago, an ancient book was discovered, entirely composed of lead. Not only were the two pieces that formed the cover, and the leaves, six in number, of lead, but also the stick inserted through the rings to hold the leaves together, as well as the hinges and the nails. It contained pictures of Egyptian idols. The Egyptians employed a broad-leafed rush growing

on the banks of the Nile, as the material to write upon. This was the *papyrus*. Parchment, which is the prepared skins of animals, came into use B.C. 250. It was so called from Pergamus, whose king, seeking to collect a library which would vie with that of Alexandria, and being debarred a supply of papyrus by the jealousy of the Ptolemies, had recourse to the substitute. Ancient books were not commonly disposed in a square form, but were *rolled* up. Hence the word *volume*, signifying a roll.

Coining money, by making copies of an original in gold, silver, copper or other metals, was also practised by the Greeks and Romans several centuries before the Christian era. The Romans were acquainted with the art of printing. Cicero, the great Roman philosopher, has passages in one of his works from which the hint of printing was taken. That author orders the type to be made of metal and calls them *formae literarum*, the very words used centuries afterwards to describe them. Agesilaus, king of Sparta, by stratagem to animate his soldiers to battle, wrote upon his hand "nike," Greek for victory, and then by pressure imprinted the same word upon the liver of the slain victim, and the letters thus impressed became in the eye and imagination of the superstitious multitude a pledge of military success. We also learn of a Sultan who, on signing an edict, dipped his whole hand in blood, and then impressed the paper. The children of the Romans were taught spelling with the help of small tablets having elevated letters, which they combined in words.

Printing, however, as defined above, usually implies the use of a pigment like printers' ink. The Romans had metal stamps for marking names, goods, etc., to which it is supposed they sometimes applied ink, thus using them as handstamps are used at the present day. It appears from the nature of these handstamps that the essential features of modern printing were understood by the Romans, but the time was not ripe for the invention of printing.

Before its invention in China in the eleventh century, printing with the aid of a pigment was not known to have

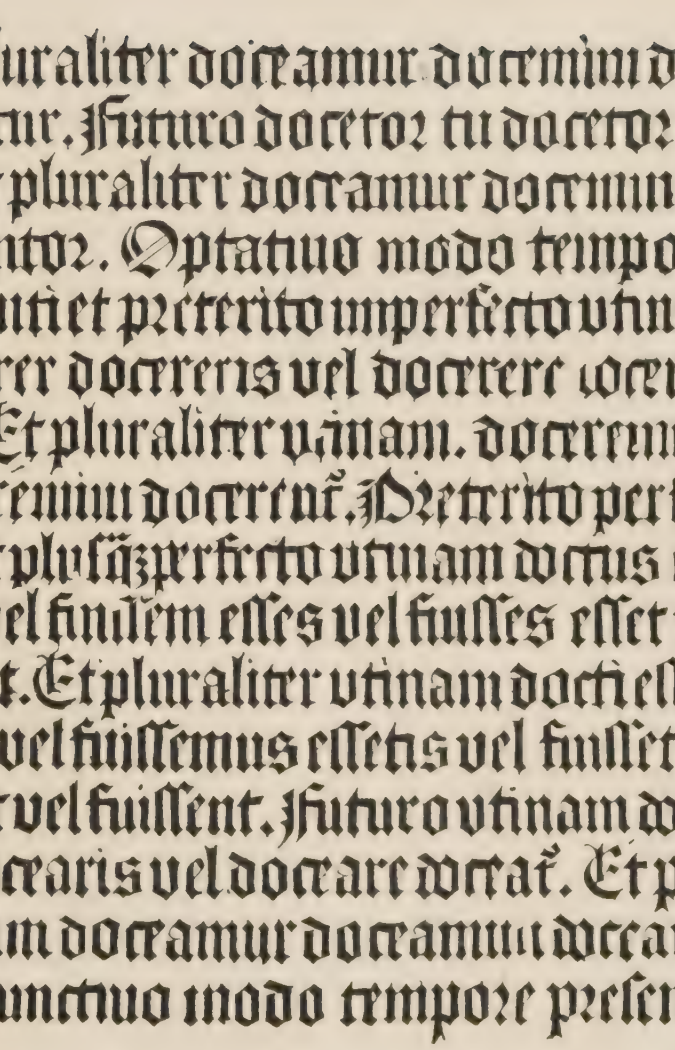
been applied to literary purposes. The Chinese were the first to impress upon paper, or similar substances, the reversed transcript of engraved characters, through the conjoint aid of ink and pressure. Each page was very neatly written on thin transparent paper, then glued face downward upon a smooth block of wood. The plain or white parts were cut away with most wonderful rapidity, and the drawing left in relief. Both sides of the block were similarly operated upon. The engraved wood was then properly arranged upon a frame, and the artist, with a large brush, covered the whole surface with a very thin ink; he then laid very lightly over it a sheet of paper, then passed a large brush over it, lightly, yet so surely that the paper was pressed upon the raised figures, and upon no other part. One man printed ten thousand sheets in one day! The Diamond Sutra, printed in China by Wang Chieh, now on exhibition at the British Museum in London, is the oldest book known, the date is given as May 11th, 868. It consists of six sheets of text and one shorter sheet with a wood-cut, all sheets pasted together so as to form one continuous roll 16 (!) feet long by one foot wide. Each sheet is 2½ feet long by one foot wide, indicating the large size of the wooden blocks used. However, the printing of the Chinese appears never to have advanced beyond the style of wood-block books. In Rome, copies of books, records, speeches, etc., were readily, rapidly and cheaply multiplied by slaves, who were educated to serve as copyists or scribes. Thus the books of those early days are called *manuscripts,* from *manus,* the hand, and *scribere,* to write. Writing of books by hand continued to be the only method practiced throughout centuries until the great migration of peoples was ended. The surging, driving ahead, the clashing together of the many different European peoples with the assaulting, onward storming tribes out of the East lasted for several centuries, and out of this turmoil there emerged a new European state formation. In this epoch of brutal might and endless battling, culture and scientific pursuit found but isolated havens of refuge. The remnants of learning and erudition took flight to the monas-

teries. Even the art of reading and writing, in the early Middle Ages, was known only to the clergy. The monks, almost exclusively, undertook the reproduction and multiplication of all spiritual and worldly statutes, bibles and other manuscripts; it was they who wrote the public documents.

The monks did not content themselves with simply copying; they developed it to an applied art. Some did the writing (*scriptores*), others compared and corrected the scripts and provided manuscripts with headings (*rubricatores*), and set them out in columns. Those possessing artistic skill painted initial letters (*illuminatores*), marginal adornments and miniatures (*miniatores*). The results of all this painstaking labor were pieces of veritable fine art, which were often bound in satin with covers of gold and silver, studded with precious stones. Cloth, linen, silk, parchment and vellum were used to write upon. Vellum, the skin of very young or abortive calves, was exquisitely stained in tints of rose, purple, yellow, blue and green. King Henry the Second was influenced to enact a law that of every work published in France one copy should be written on vellum and sent to the Royal Library, and this kingly order laid the basis of the splendid collection of vellum books in the Library of Paris. Books in those times were scarce and costly. Only the rich, the monasteries and the universities had libraries. The Countess of Anjou bought a book of Homilies, paying for it two hundred sheep, five quarters of wheat and the same quantity of rye and millet. The Cathedral of Notre Dame in Strasbourg was famed for its splendid collection of five hundred volumes. In Oxford, books were put in the pews or studies and chained to them.

BLOCK PRINTING

The next step towards the invention of printing was the impressing of plates made out of one single block of wood upon which was engraved in relief the matter one proposed to print. In our days this would be designated as a wood-cut. Towards the end of the fourteenth century, the wood of the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Facsimile Page of Block Printing, Now Preserved in the National Library in Paris

linden and of the beech tree was used, the matter carved with a sharp instrument in longitudinal sections; images of the Saints and playing cards were the first products made from such wooden plates. Great were the inconveniences experienced in the employment of these wooden plates, engraved in one single piece. It was necessary to make as many of these wood-cuts as the book had pages, engrave as many letters as there were in the copy, none could serve elsewhere than in the plates wherein it was fixed or engraved. The letters were without uniformity and the mistakes made by the engraver could be eliminated only by inserting in a solid block smaller wooden strips, which very rarely had the same stability as the full block of wood. These wood-cuts were alternately wetted with pigment and dried again, became bent and cracked, and were not of long service. In due time and through long practice, the wood engravers advanced to the stage where they carved entire books, primers which were called *Donates*. Donatus was a Latin grammarian.

Printing from these wood-cuts was not accomplished with a press; the paper was placed upon the form, the latter blackened with an earthy color, and then through application of a soft dabber the paper was printed against the picture or text. The back of the paper could not be used; these prints were all one-sided and a sheet printed only on one side was called Anopisthographic. In order to bind these loose leafs into book-form, two pages were printed side by side on one sheet of paper. This sheet was folded in the middle and the inner blank margins formed the back of the book. Even long after the invention of the art of printing, this kind of printing from wood-cuts remained in practice, and took the place of modern stereotyping. The wooden tablets for such pamphlets of which several editions might be required were preserved and used when needed. By the middle of the fifteenth century the art of reproduction was thus far advanced, and as intellectual life flourished, the craving for art and for the products of classical literature became more pronounced. Momentous questions pertaining to matters of the Church were the order

of the day and awaited their solution. The time for the discovery of the art of printing was ripe, and it was, as soon as it became a necessity, not long in arriving.

From printing from movable, one-piece wood-cuts to the idea of printing with movable letters is indeed only one step; if one visualizes the printing block cut up in single letters, it becomes evident that one can assemble these letters to one's liking in other ways and thereby form a new text. The principle of the printing art does not consist only in the idea of assembling carved letters together, but in manufacturing metal letters mechanically, casting them in matrices, and to mechanically multiply with the aid of a press and ink the form set up with these letters. In one word, the invention of printing is bound up with the inventions of type casting, type setting, building of presses, press printing and printing ink. The invention of printing therefore was not simply a happy inspiration but the result of long search, laborious drudgery and oppressive worries.

DISCOVERY OF THE ART OF PRINTING

There is a controversy concerning the first discoverer of the art of printing as just defined. The Dutch city of Haerlem, the German city of Mentz, and the Alsatian city of Strasbourg attribute it to their own countrymen. The dispute, however, is turned rather on words than on facts; it seems to have arisen from the different definitions of the word printing. If movable types be considered as a criterion, the merit of the discovery is due to Johannes Gutenberg of Mentz. From all arguments and opinions which have been adduced in the important controversy and which fill scores of ponderous volumes, the conclusion may be satisfactorily drawn that to JOHANNES GUTENBERG is due the appellation of the father of printing, and to his associate, Peter Schoeffer, that of father of letter founding.

Gutenberg arrived at his goal in the year 1452. His re-

flections, leading to his invention, seem to have been the following:

There are in the alphabet twenty-six letters, and the same letters are used over and over to spell many thousands of words. In a page of words portions of the alphabet are employed numbers of times; after printing has been accomplished with the solid wooden block the carved letters are lost. If, instead of engraving the whole page on a solid wooden block, small movable blocks were used for engraving each letter, then the same letters could be used any number of times. The letters would have to be carved in wood with small handles to them so that they could be taken up and placed together as if one were spelling. The result of this reasoning was the birth of movable type—the keystone of the art of printing. Out of a piece of hard wood, Gutenberg sawed some thousand tiny blocks, a few inches long and very narrow. At one end he cut a letter in relief, and bored a hole through the other. After having thus furnished himself with a number of the letters of the alphabet, he placed whole words together, arranged them in lines on a string, until they formed a page; then he bound them together with wire and so prevented them from falling apart. Gutenberg then blackened his wooden type with ink and taking up the whole together, he pressed it upon a sheet of paper. It was the Lord's Prayer with which he made his first attempt at printing with movable types.

Instead of holding the type together with cord and wire, Gutenberg's next step was the invention of a frame with wedges to keep the type in place. Thereupon he constructed the press to imprint with; it was a simple wine-press, a common screw press. Ink softened the wooden type, injured the shapes of the letters and necessitated frequent renewal. Gutenberg first tried a method of hardening the wooden letters, but did not succeed. Then he and his associate Schoeffer experimented with lead. This, however, was too soft and would not bear sufficient pressure to print. They then tried iron but this metal pierced the paper. At last they hit upon a

mixture of regulus of antimony and lead. This material proved to be of requisite softness and strength.

As to ink, common writing ink would not answer, being so liquid as to spot the paper with blots. Finally, a mixture of linseed oil and lamp-black or soot was tried and found to be the right thing. The ink was applied to the type by a dabber, a ball of sheepskin stuffed with wool. It had the appearance of a huge mushroom.

Wearying of the monotonous cutting of type, Gutenberg and Schoeffer began to make casts of type in molds of plaster. A new mold was required for each letter. Schoeffer thereupon cut impresses for the whole alphabet, cut punches and cast type with them.

Gutenberg's first important work was the printing of the entire Bible; making one hundred Bibles took six men six years, working all day. His Bible was begun 1450 and finished at the end of 1455, printed from *cut* metal types, not cast as we have them at the present day. Each single letter had to be engraved. Three hundred impressions were made on the press per day working it continuously. This Gutenberg Bible consisted of two volumes, the first had 324, the second 317 pages. The size is almost 12 inches high and 8 inches wide, printed in double columns. The initial-letters in the parchment copies are in gold and various colors, in the paper copies they are painted in blue and red. Each page, with the exception of the first ten pages contains 42 lines, hence the designation of these Bibles as the 42-line Bibles. Only 31 of them are known to be left, ten on parchment and 21 on paper. It is interesting to note that quite recently an American book collector paid $106,000 for one original copy of a Gutenberg Bible. Gutenberg's last important work was the "Katholikon", a Latin dictionary and grammar, finished in 1460.

As a contemporary of Gutenberg wrote, "Nothing yet invented by man, ever made such inroads on ignorance as this invention will effect. No more hoarding of libraries which kings and prelates and priests alone may read. The common people will also have their books."

JOHANNES GUTENBERG

In order that the art of printing might not be divulged, Gutenberg administered an oath of secrecy to all the printers he employed. This was strictly adhered to until the year 1462, when following up a mighty strife between Diether, Archbishop of Isenburgh and Archbishop Adolphus of Nassau, the latter stormed and pillaged Mentz. The city was fired and the printing establishment of Gutenberg was laid in ruins. Gutenberg's printing franchise was revoked. Through the consternation occasioned by this event, the workmen believed that their oath of fidelity was no longer binding, they fled to other cities and to other countries, and there exercised their profession and instructed others in the art of printing. The end of the 15th century saw this art exercised in the greater part of Europe. Among the many celebrated printers in Europe who carried on Gutenberg's invention and brought it to a high degree of perfection were:

Aldus Manutius of Venice, Italy,
Stephanus Etienne of Paris, France,
William Caxton of London, England,
Christopher Plantin of Antwerp, Belgium,
Louis Elzevir of Leyden, Holland,
Giambattista Bodoni of Parma, Italy.

Chapter Two

STEREOTYPING

In the year 1795 the celebrated French printer and typefounder, FIRMIN DIDOT of Paris, coined the name "STEREOTYPE" for printing from solid lead plates.

Stereo, in Greek, means rigid, solid, and the Greek word *typos* means type, letter, character. Hence the combined word stereotype means a rigid, solid plate made of types. Stereotyping is the method of making of type metal perfect facsimiles of the faces of pages composed of movable type.

If we have reason to be surprised at the quick steps by which printing with movable types was perfected, we have more cause to wonder why, with the acquisition of movable types, the art became stationary. The transition from founding single letters to founding whole pages was so invitingly obvious, that the circumstance of its not having been attempted, may be imputed rather to a want of enterprise, than to any ignorance of the perfect practicability of the art. The art of printing from movable types was invented in 1452, and it was not until 1701 that the first attempts at stereotyping were made in Europe.

Printing from stereotypes is, in one respect, the reverse of printing from movable types. As described above, the first books were made from solid wooden blocks, each of which formed a page. Then came typography (meaning writing, "graphein", from type, "typos") the assembling of letter into words and pages, in which these pages were composed of numbers of separate types. There followed the period of the invention of stereotyping, in which pages again were formed by single blocks, that is, where printed pages were solidified or made rigid in one plate. The distinction between the two is, that whereas the antique blocks were of wood, the later ones were of metal; and that while the one kind consisted of originals that were separately engraved, the other are mechanically produced copies, and cast in a mold. The disadvantages

of printing certain works with the aid of movable types which led to stereotyping were the following: It was necessary before redistributing types, that the *whole* number of copies of which it was wished that the edition should consist, had to be printed at one single time and at once. Then again there was a great disadvantage of advancing capital for large editions, thus tying up considerable funds in standing type and pages preserved in this manner were constantly liable to become incorrect by letters being misplaced or dropping out. There was also always the element of danger involved, making mistakes in the new form, causing thereby offence and annoyance in books of a religious nature, or grave errors in technical, dramatic and classical works. Another danger was the jumbling of types ("pi") caused in the transport of forms from one establishment to the other. Before the art of stereotyping was invented, the forms of such works had to remain intact, stored and in some cases, for instance the Bible, thousands of pounds of metal types were stored away.

These many inconveniences led to experiments to overcome them; stereotyping was the ultimate result.

A CHINESE PIONEER

It appears that the first attempt known to exercise a crude sort of stereotyping was made in China; however, the method used was later lost and never introduced in Europe. In the year 1041 a Chinese blacksmith, named PI-SHENG, invented a method of printing with plates, called "ho-pan", or with plates formed of movable types—this name being still preserved to designate the plates used in the Government Printing Office in Pekin. The method employed by Pi-Sheng is interesting. He made a paste of fine glutinous earth, forming regular plates of the thickness of a Chinese piece of money called "tsien", and engraved upon them the characters most in use, making a type for each character. He then baked these types by the heat of a fire in order to harden them. He then placed upon the table a plate of iron, and covered it with a

coat of very fusible mastic, composed of rosin, wax and line. When he wished to print, he took an iron frame sub-divided by narrow perpendicular bars of the same metal—the Chinese writing from above downwards. This frame was placed upon the iron plate, and the types were then arranged upon it, pressed closely together. Each frame thus filled with type formed one plate or page. The plate being heated at the fire sufficiently to soften the mastic, a smooth piece of wood, serving as a planer, was then placed upon the composition, and the type was fixed into the mastic by pressure. By using two of these forms alternately, the impression of each page was produced with great rapidity. When the printing from a plate was completed, it was heated again to soften the mastic, and the types were brushed by hand, detaching them from each other and freeing them easily from the mastic. When Pi-Sheng died, so says the Chinese Chronicler, his friends, who inherited his type, preserved them as very precious, but discontinued the practice with them. Pi-Sheng had no successor and in the course of time the invention was lost.

INVENTION OF STEREOTYPING

The first experiments at stereotyping in the sense of the definition placed at the beginning of this chapter were made in Europe in 1701. JOHANNES MUELLER, clergyman of the Reformed Church in Leyden, Holland, discovered a new way of utilizing the art of printing by employing movable types. After the pages had been composed, corrected and set up in a form, he turned this form over on its face and cemented it into one solid plate by means of a mastic (window-putty) or, in a second experiment, with a metallic composition (lead). Later on Mueller immersed the bottoms of the types nearly up to the shoulder of the letter in the mastic or solder, thus rendering the entire page one solid mass.

The first trial of this process was made in 1701 with a book of prayers of Jean Havermans, printed by Mueller's son, William. Later on, Mueller and his son associated them-

selves with VAN DER MEY, the father of the celebrated Dutch painter, Jerome Van der Mey, and these three men, in 1711, prepared in the above described manner for Samuel Luchtmans, a bookseller of Leyden, the pages of a quarto and of a folio edition of the Bible. One hundred years later, Luchtmans' successors sent copies of this stereotyped Bible to Paris, accompanied them by a letter stating that "we have sent you a copy of our Stereotype-Bible. All the plates of it are now in our possession, and nothwithstanding that many thousand copies have been printed from them, they are still in very good condition. They are formed by soldering the bottoms of common type together, with the same melted substance, to the thickness of about three quires of writing paper."

This invention of Mueller may be considered as an intermediate link between the operations of the common letterpress printing and those of stereotyping, as practiced at the present day. Mueller soldered his plates together, and therefore he required *separate* composition of the types for each form made. Stereotyping, however, in the modern sense of the word, means reproduction by *casting* and its advantage is multiplication *without* re-setting of type.

The great objection, however, to Mueller's method was its costliness, as the type used was no longer available for any other use. Johannes Mueller died in 1720, and his art of preparing solid blocks was, at the death of his associate Van der Mey, not employed any more.

A process of so-called stereotyping somewhat similar to the one practiced by Mueller and Van der Mey, is reported to have been used shortly afterwards by Athias, a printer in Amsterdam. Athias executed at a great expense, in what year is unknown, an English Bible, of which he preserved all the forms of the type, in such a manner that nothing could be added to, nor taken from them. Gessner, a Zurich printer, who first related this fact, adds that he had seen these solid forms carefully preserved. It is also generally recorded that Athias ruined himself by this speculation, such an edition of the entire Bible having tied up an immense amount of money.

THE STORY OF WILLIAM GED

A great advance in the new-born art of stereotyping was effected by William Ged, (born 1690, died 1749). We owe the following data concerning Ged to his own book entitled: "Bibliographical Memoirs of William Ged, including a particular Account of his Progress in the Art of Block-Printing. 1781. London."

By birth a Scotchman, Ged was successful as a goldsmith, in Edinburgh, and was widely known for his inventions and improvements in his business. As a goldsmith, he became to a certain degree a banker, and was brought into connection with the trade by furnishing money for the payment of the printers. In the year 1725, one of the printers complained to Ged that he was seriously embarrassed by being forced to send to London for type, there being then no type-founders in Scotland, and that much of the English type was imported to undertake the business of letter-founding; Ged was struck with the idea of making plates from the composed pages, believing that it could be successfully done. He borrowed a page of composed type, and made many experiments with a variety of materials, but did not complete his invention until two years afterwards.

The following was Ged's method of stereotyping: He set up his page with movable type, locked his form and then the page was laid upon gypsum or plaster of Paris, or some other semi-liquid substance, just as it was drying; when it was dried completely he removed the form from the gypsum cast, and using this cast as a matrix, he formed solid plates of lead. From these he printed on the ordinary letter-press. The letters on the edges of the plates stood up rather higher than those in the center.

Although in possession of some capital, Ged offered one-fourth interest in his invention to an Edinburgh printer, on condition of his advancing the sum necessary to establish a stereotype-foundry. This partnership lasted two years, but the printer failed to fulfill his promises. A London stationer,

Interior of a 16th Century Printing Shop

named William Fenner, visiting Edinburgh, next offered to establish a foundry in London, in full working order, for one-half of the profits. Ged, now exceedingly anxious for the success of his invention, accepted these terms; disposed of his business in Edinburgh, and followed his new partner to London, to find himself again deceived. With many plausible pretenses, the stationer induced the unfortunate inventor to add a type-founder to their partnership, who furnished refuse type, which Ged rejected as totally unsuited to his purpose. Still undiscouraged, Ged applied personally to the King's printers, with a proposal to stereotype some type which they had recently introduced. The printers naturally consulted the type-founder who had made the type, and he as naturally denied the utility of the invention. An interview, however was arranged, which led to the curious result of the founder laying a wager that he could make the stereotype himself. The foreman of the King's printing-house was made the umpire. Each of the disputants was furnished a page in type of the Bible, under the promise that he would furnish the stereotype in eight days. Upon receiving the type, Ged went immediately to work, and the same day finished three plates of the page, took impressions from them, and carried them to the umpire, who acknowledged his success with much astonishment.

The fame of the invention soon afterwards reached the Earl of Macclesfield, who offered Ged and his partners the vacant office of printer to the University of Cambridge, and on the 23rd of April, 1731, Ged eagerly accepted the position. A lease was sealed to him and his associates for the privilege of printing Bibles and common Prayer-books with his new process. Ged went to Cambridge but the letter-founder prevented his success, by treacherously furnishing imperfect type, and even when Ged sent to Holland for new fonts he was again deceived. He encountered every possible form of opposition from the compositors, who, when they corrected one fault, made purposely half a dozen others, and the pressmen,

when the masters were absent, battered the letters in aid of the compositors. In consequence of these proceedings, the books were suppressed by authority, and the plates sent to the King's printing-house, and from there to a type foundry, where almost all of them were melted and re-cast into single types. After all this ill usage, Ged, who appears to have been a man of great honesty and simplicity, returned, financially ruined to Edinburgh. His friends in that city were anxious that a specimen of his art should be published and therefore subscribed a sufficient sum for the stereotyping of a single volume. The unfortunate inventor apprenticed his son to a printer in order that he might no longer be subjected to the enmity of the trade. With the assistance of his son Ged produced, in 1736, after eleven years of endeavor, the first public proof of his success, an edition of the works of a Roman historian, Sallustius. On account of the inferiority of the type, this volume was not a fine specimen of the art, but was sufficient to prove that the invention was completed. Ged's son devoted himself to acquiring a knowledge of printing but just at the moment that he was fully prepared to effectually assist his father, the unfortunate inventor died. Although suffering so bitterly at home, Ged refused several offers, either to go to Holland, or to sell his invention to printers of that country, declaring that he only desired to serve his native land, and would not hurt it by giving the printers of another country such an advantage.

A few rare samples of his stereotype plates escaped the melting pot and came into the possession of Thomas Curson Hansard, who made a reprint of two such plates for his book entitled "Typographia".

These reprints demonstrate Ged's rather raw execution of his particular method of stereotyping. The secret of Ged's invention slumbered after his death, until it was re-discovered and greatly perfected by Lord Stanhope in London. After Ged's death in 1749, his son published a pamphlet wherein he explained the advantages of his father's invention and pro-

posed a subscription, in order to finance new editions of Ged's books. It appears, however, that this subscription did not materialize.

THE CLAY PROCESS

During the same period when Ged was working out his stereotyping process, a French printer, GABRIEL VALLEYRE by name, invented in 1730 a method of casting plates in molds, which he used for making calendars which were placed at the opening page of church books. The method discovered by Valleyre was the so-called *clay process*. He pressed the set-up form of movable type in clay or other earthy substance; removed the cast made in this manner from the form and then poured molten copper into it. His clay or his copper was faulty; the edges of the letters were not clearly and sharply defined, the surface of his plates became rounded and many letters were broken. One advantage of his process was that it took the mold from low spaces and quadrats without filling them up. (A long time afterwards Valleyre's method was revived, improved, and employed in the Government Printing Office in Washington. The thus modified "clay stereotyping method" was used there as follows: The form was placed upon a movable bed of an iron molding-press. A flat iron plate was screwed upon the inside of the lid of the press, and upon this plate a thin layer of prepared clay was spread. Preliminary impressions were taken to obtain the outlines of the type and to remove the dampness from the mold. The surface of the form of type was rubbed with benzine; the lid of the press closed and clamped by means of a lever, the movable bed of the press was raised and the mold thus obtained by pressure. Then the mold was taken out and placed in a slow-drying oven. This operation took a few minutes for drying, and then the molding-plate, separated by a thick wire bent in shape to fit the bottom and sides of the plate, was clamped fast to a companion plate of equal size. Into the opening between the plate, formed by the wire, molten stereotype-metal

was poured, and the stereotype cast by this clay method was formed.)

J. MICHEL FUNCKTER, whose methods are described as having been practiced in Germany about 1740 merits being mentioned, because his operation was akin to the one practiced by Ged and later on by the printers in France. Funckter, a printer of Erfurt, published in that city in 1740 a little pamphlet entitled: "Short but useful introduction to the cutting of wood and iron plates, to make types, ornaments and other drawings and also to the art of baking plaster, preparing sand molds for type-casting, vignettes, medals and forming of matrices therefrom." This pamphlet called the attention of many printers to the new art of making solid printing plates.

Without having any knowledge of Mueller or Ged, ALEXANDER TILLOCH, editor of the "Philosophical Magazine" and part proprietor of the "Star", a London daily newspaper, conceived the idea of stereotype printing in 1781, and in the following year he entered into partnership with the printer to the University of Glasgow, ANDREW FOULIS by name, in order to carrying on the business of stereotype printing.

At the start of their venture, they advertised the following arguments regarding solid-plate printing to the book-printers and book-sellers: "If founding could be applied to single letters, why not to pages, to get rid of a sacrifice of capital submitted to at first because of the enormous expense of block-cutting. Founding of pages, on the first view of it, promises many advantages in point of economy; and to science it holds out, what can never otherwise be obtained—the possibility of procuring, in a short time, Immaculate Editions. From books cast into solid pages, no more copies would be printed than might be wanted for immediate sale; the money thus saved from being sunk into paper to be piled up in warehouses for years, as at present, would serve as surplus capital to print other works; all errors as soon as

discovered, could be rectified in the plates, to prevent them from appearing in later copies, instead of running thru a large edition, as at present." After great labor, and many experiments, these gentlemen overcame every difficulty, and were able to produce plates, the impressions from which could not be distinguished from those taken from the types from which they were cast. Though they had reason to fear, from what they learned Ged had met with, that their efforts would experience a similar opposition from prejudice and ignorance, they persevered in their object for a considerable time, and at last resolved to take out patents for England and Scotland, to secure to themselves, for the usual term, the benefits of their invention.

The patents were four in number and dated April 28th, 1784, being granted to Andrew Foulis and Alexander Tilloch, "for a method of making plates and for the purpose of printing by or with plates, instead of the movable types commonly used, and for vending and disposing of said printing plates and the books or other publications therewith printed, whereby a much greater degree of accuracy, correctness, and elegance will be introduced into the publication of the works both of the ancient and modern authors than had been hitherto obtained." The specification gives but a meagre account of the details of the process. The plates, it said, were made by forming molds or matrices from the page of the books or other publications to be stereotyped, and such molds or matrices were filled with metal or with clay, or with a mixture of clay and earth. Tilloch explained that his molds were by preference taken in plaster of Paris; the plates were thin, and mounted on wooden blocks.

Owing to some circumstances of a private nature, not connected with the stereotype, the business was laid aside for a time, and Tilloch having moved from Glasgow to London, the concern was dropped altogether; but not till several volumes had been stereotyped and printed under the direction of Tilloch and Foulis.

POLYTYPING AND LOGOGRAPHY

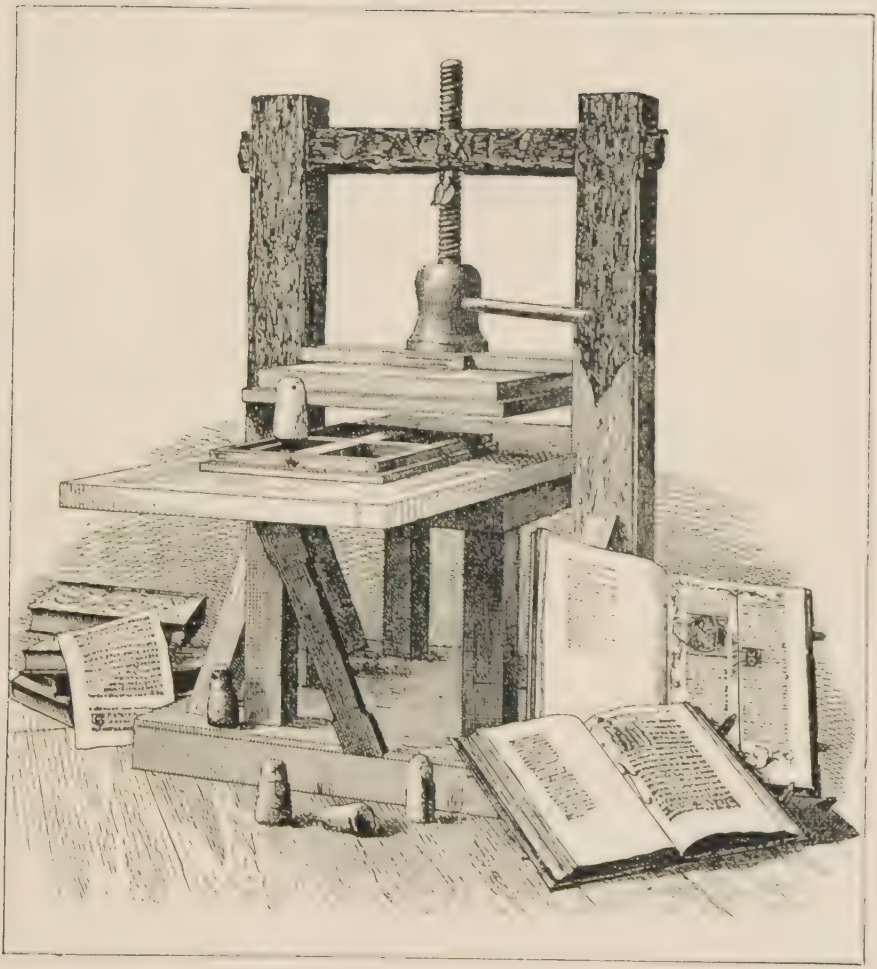
Conforming to the chronological order of this booklet, a report is now due on two methods known as *Polytyping* and *Logography*.

Polytyping is the art of producing by mechanical means, from engraved plates or otherwise, any number of plates capable of multiplication. The "sister arts" Stereotyping and Polytyping are so connected, and the processes, which have been used in one, have often so great an alliance with those of the other, that it is not easy to separate them. The process of Polytyping differs from Stereotyping in the fact, that while a stereotype is taken by pouring molten metal on the mold, the polytype is made by a method akin to die-sinking.

Polytyping was used only for the reproduction of small wood-cuts or typographical ornaments. For that purpose it was considered by some founders to be superior; duplicates could be produced more rapidly than by stereotyping, and at a cheaper rate, and the blanks or whites of the polytype were much deeper than those of the stereotype.

Logography is a method of composition consisting in the art of arranging and composing for printing with entire words, their roots and terminations, instead of single letters.

The first experiments with Logography were made by Henry Johnson, a compositor of London, in the printing establishment of his employer, Mr. Walter, owner of the "Times." A patent for Logography was granted him in 1783. Johnson's aim was to simplify the basic technique of type-setting, which had remained stationary for centuries. He cast certain of the most used words and syllables and used these casts together with the ordinary type, hoping thereby to speed composing to a degree. Altho this method was never universally adopted, it found imitators and perfectors even up into our times. Johnson also intended to save labor for the compositor, for instead of lifting the word "and" in three



GUTENBERG'S FIRST PRINTING PRESS

letters, if cast as a logotype, he picks it up as one. The combined letters stated to have been found of greatest value were:

be	com	con	ent	ion	in
for	ge	ing	ld	me	the
and	th	ve	al	re	os

The London "Times," when it was first published, used logotypes for a while but then abandoned them, on account of their proving practically useless, the compositors being able to set up more type in a given time by the old method, than by using logotypes. Other weighty objections urged against logotypes are the additional space or case-room they require (about 480 cases), if they are sufficiently numerous to be of material service; and the waste of type which results from the necessity of destroying a whole word whenever a single letter is battered. For some years, this "Times" and a few other unsuccessful experiments, led to the total abandonment of the logotypes, but recently they have attracted the attention of inventors.

The names given in the course of years to the different inventions of this nature were many; for instance, Logography, Logotypography, Polyamatiamie, Typocheographie, Hamapoligrammatiamie (!).

As far as the art of Polytyping is concerned, the first invention therein was made in 1784 by FRANZ IGNAZ JOSEPH HOFFMANN, a native of Alsace, who had drifted to France and settled in Paris. Hoffmann was incited thru Ged's work and thru a remark concerning several metallic combinations made by Darcet in 1773. The method Hoffmann discovered was: with a page composed of types in the usual manner, he made an impression on a mass of soft fatty earth mixed with plaster of Paris or gypsum, and prepared with a glutinous paste of syrup of gum and potato starch. This impression became a matrix, into which a composition of lead, bismuth, and tin being pressed at the moment of casting, gave plates which exhibited in relief, facsimiles of the types which had been used to form the matrix. The impossi-

bility to sink each single letter absolutely in the same horizontal direction and in the same depth into the matrix composition, in connection with other relatively less important drawbacks convinced contemporaries that this method was entirely impracticable and unserviceable. The apparatus used for Polytyping somewhat resembled a pile-driver.

A further practice of Hoffmann was that he formed two sorts of types or puncheons; one for detached letters, and the other for letters collected into the syllables most frequently occurring in the French language. This was simply following up Johnson's independent discovery of logography. Hoffmann was granted a patent and a franchise in 1785, and his three volume work, printed with logotypes, created quite a sensation, notably in France, but notwithstanding this success, his establishment was closed in 1787 thru a Government decree. It appears that the reason for this act was that Hoffmann had been engaged in printing prohibited writings.

In 1785, JOSEPH CAREZ, a printer at Toul in France, happened to obtain some numbers of Hoffmann's "Journal Polytype". He was struck with the advantages which the new process seemed to offer, and carried on a series of experiments in editions which he called "omotyped", meaning the junction of many types in one. Carez executed several liturgical and devotional works, and among others the Vulgate Bible in nonpareil, which possesses great neatness. Carez carried out his process in the following manner: The page being locked up, was placed downwards on a block of wood suspended from one arm of an iron lever. On the top of a wooden pillar there was a cardboard tray smeared over with oil. A quantity of molten type-metal was taken from a furnace, and poured into the cardboard tray. The moment the metal began to be clouded by cooling he let fall upon it the block of wood and the page attached. In this way an impression of the page was formed. This plate, after being trimmed, was fixed to the under side of the block, and let fall upon some fused metal placed as before on the bed of the machine, and thus was obtained a plate in relief fit for print-

ing. The most serious drawback of the Carez method was the difficulty encountered in getting his type-form off the chilled metal.

In 1786, PINGERON, a skilful mechanic, varied the Hoffmann process: For the purpose of stereotyping, he proposed to make a composition, formed of talc, gypsum, clay, Venice tripoli, and formers sand, capable of receiving a clear impression; to press into this mass the face of a page composed of types and then to pour melted type-metal into the matrice thus formed. He also used a sand-pit for molding, and a composition of German spar, salammoniac, etc., which would bear several castings before being destroyed.

All experiments of this nature were doomed to failure, as they were in direct opposition to the basic principle of the art of printing—the division of written matter into small and movable parts, namely into single letter types.

The art of stereotyping received a great deal of attention during that period of money inflation when the French government ordered the printing of the collossal quantities of paper money, so-called *assignats*. This work had to be done as fast as possible, and it was necessary to guard against forgery of those bills. Recourse was taken to stereotyping and not only were the hitherto known methods practiced, but a number of new ones were discovered. The first issue of *assignats* was printed in 1790; they were, however, scarcely out of the hands of the printer before they were counterfeited and great difficulty was experienced in recognizing the genuine *assignats* of the government. It became evident that *every* plate would have to be identical. A modification of Hoffmann's polytype process was resorted to; casts were taken of the separate parts of the bills and these became matrices, these again were united and a single matrix formed, which was struck into molten metal. This operation was called *clicher*, the word being used by the die-makers to express the striking of melted lead, in order to obtain a proof. It signifies to let a writing fall perpendicularly and forcibly upon molten metal. Since this time up to the present day the

word *cliché* has been generally applied to stereotype plates by the French.

In 1795, when the Revolutionary Convention had begun to issue lottery tickets, a printer named GATTEAUX was charged by the National Assembly to print these tickets. The process he developed was to sink the face of the type into a plate of *cold* metal by means of a screw press. Gatteaux's brother-in-law, Anfry, invented a harder metal than that heretofore used for types, which prevented their being damaged when being violently impressed in a plate of lead. This hard metal of Anfry was largely composed of silver, therefore very costly.

During this same period, the printing establishment of FIRMIN DIDOT (born 1764, died 1836) operated an extensive stereotyping plant. Didot is the name of a family of eminent printers in France, who have pursued the calling with remarkable success from the year 1713 to the present day. Firmin Didot deserves special mention for his elegant and correct cheap stereotyped editions. He published as his first Gaillets "Logarithms" which he announced as a "stereotyped" work, thus being the coiner of the now so familiar word. This book was set up in types and the pages afterwards incorporated in one solid mass, the plate soldered at the base. This shows that in the start, Didot followed the process invented almost a century ago by Mueller and Van der Mey.

THE FIRST COMMERCIAL STEREOTYPE SHOP

A workman in the employ of Didot, Louis Stephan Herhahn by name, devised a new process of stereotyping upon which he obtained patents in 1798 and 1800. Herhahn worked in conjunction with his employees, Errand and Renouard, under the supervision of Count Schlabrendorf. He had copper type made, in which the letters were sunken, but in such a manner that the letter-face did not appear upon same reversed. With these copper types he set up his form,

and from this copper form he made a cast in lead. The printing plate therefore was made DIRECTLY from the copper composition of form. This very costly experiment had the great disadvantage that the sunken letters did not permit of correction, and without possibility of correcting, the process was impracticable. Thus every type needed in a printing shop using Herhahn's method of stereotyping had to go thru the separate manual operations of filing, dressing, arranging, striking with special punch, lining and properly adjusting for the nicety of printing. A labor for which no adequate remuneration ever could be expected.

After Herhahn's first patent was granted, Pierre Didot, Firmin Didot and Herhahn entered into a partnership to exploit it. They issued a pamphlet called "Prospectus of stereotyped editions". This is the first prospectus of its kind. They announced therein the formation of a partnership for the purpose of quickly and accurately employing the new stereotyping methods for which they enjoyed a patent. They specifically stated that in their stereotyped editions, correctness would be a special merit, which would be carried to the highest degree of perfection, based upon the fact that even if in the first impression a few mistakes would creep in, it would be an easy task to correct these on the plate, which is always at their disposal, before making new impressions. They further stated that they would sell these stereotype plates in two sizes, 18mo and 12mo sized pages, the latter at francs 3.75 or 75 cents a page. In case of loss or deterioration they offered to furnish another copy of the same plate at the price of francs 12.50 or $2.50. Independent of the advantages of most perfect correction and of being able to furnish these books or plates at a very modest price, since copies were printed only when needed, there would be no storing of paper, no warehouse charges, etc.

The new editors also called attention to the fact that should a customer lose a volume, forming part of a set, they would replace same at the original price, the plates for reprinting always being at their disposal. This prospectus

aroused a deluge of derisive remarks and criticisms. The consensus was "that this so-called art of new stereotyping, which embodies all the inconveniences of an old process long abandoned because of its imperfections (meaning the process of Hoffmann), tends to retrograde the art of printing; that by stereotyping one can never reproduce an impression as beautifully as made by movable type; that without showing any visible advantage for the announcers, it would be ruinous for all others who would make use of such plates." The prices were objected to as prohibitive, etc. All this clamor did not keep the three associates from going ahead with their stereotyping business. In 1810 about 2,000 plates were made in Paris every month.

Other stereotyping shops were established, where the same methods were used with very slight changes. It would lead too far to recount these different adaptions of the existing processes; worthy of mention are DARCET, ROCHON, THOUVENIN, GENGEMBRE, BULLIARD and LHERITIER. BOUDIER produced in 1798 some specimens of stereotype printing by a process entirely different from Herhahns, proceeding as follows: Boudier's mold was taken from a page of type by sinking its face into a mass of soft clay. Into this clay matrix melted copper was afterwards poured, in much greater quantity than was required to form a plate, as it was upon the weight of the metal that Boudier depended for its entering completely into all the cavities and angles of the mold. When cold, the plate was reduced in a lathe to such thickness as was required. This process, however, had no special outstanding merits to commend its use and therefore did not become a practical success. Boudier obtained a patent on his process in 1801 and published stereotyped school books and music.

In the year 1803 a printer named Pierre de Joyeuze proposed a new method of stereotyping, which consisted of making a relief mold with clay from a page composed of movable types. His process had the advantage of cheapness, but it also had all the old defects of plates cast in clay.

THE PLASTER OF PARIS PROCESS

Each and every one of the inventions and processes thus far described was an important step forward in the building up of the art of stereotyping, but none of these methods was practiced to any great extent by others than by the men who invented them. The adoption of stereotyping throughout the entire printing world was due to the efforts and the labors of an Englishman, CHARLES MAHON, EARL OF STANHOPE (born 1753, died 1816). Stanhope did not invent any entirely new method of stereotyping, he did, however, improve and supplement the existing methods to such a degree as to make them practicable for shop work and to insure the universal use of his perfected method.

Earl Stanhope was a most interesting but eccentric character. As a politician, he carried the liberal principles of the Whig (Liberal) party of England to such lengths that for years he was distinguished as "the minority of one." His strong interest in the prosperity of the people turned his inventive genius into a useful direction, and besides the famous printing press which bears his name, he invented considerable improvements in the locks of canals, and two excellent calculating machines. The Earl of Stanhope revised and improved stereotyping. Altho, as stated above, the processes of the art had been completed in Edinburgh by William Ged previous to the year 1736, the invention seems to have died with him, and no attempt was made to revive it for many years. Tilloch and Foulis of Glasgow, and Didot of Paris experimented upon it, without however, meeting with appreciable success. Tilloch and Foulis had abandoned their pursuit for some years, when Stanhope offered himself as their pupil and paid 800 pounds ($4,000) for the instruction. Foulis spent some months at the Stanhope home in Chevening, initiating Stanhope in the practical part of the Tilloch and Foulis process. The first products stereotyped by Stanhope were standard school books. The process was communicated in 1803 to the University of Cambridge for the

very high consideration of 4,000 pounds ($20,000) and in a year or two later to the University of Oxford; but it was probably 1807 before any works appeared by the former and 1809 from the latter.

Lord Stanhope afterwards gained the assistance of Wilson, a London printer, and with few exceptions, the knowledge of the art was confined to Mr. Wilson and those in the confidence of Stanhope and Wilson. It was endeavored to keep it most inviolably secret, and for some years the endeavors to this end were successful; Stanhope filed caveats at the British Patent office covering every step as he went on; he never, however, followed up these caveats by taking out patents on the process. Stanhope and Wilson engaged in their business a Mr. Walker, who fitted up their stereotyping foundry, when, in consequence of some misunderstanding between Stanhope and Wilson, Walker, who was also original maker of the Stanhope printing presses, was encouraged by Stanhope to set up a stereotype printing office, in opposition to Mr. Wilson; being unskilled himself in the practical part of the process, Walker was secretly instructed on this point by one of Wilson's workmen, originally recommended to Wilson by Stanhope. This proceeding on the part of Walker produced a rupture between him and Wilson, who afterwards employed an eminent engineer, Peter Kier by name, to make his stereotyping apparatus.

Kier made several important improvements on it; but a quarrel having also in a short time arisen between Wilson and him, he, in revenge, taught any person who applied to him the whole of the Stanhope process for £50 ($250), provided they gave him an order for the apparatus, for which he charged £250 ($1,250), and more. The nature of the Stanhope process thus became known; and many availed themselves of this opportunity. Lord Stanhope then edited a manual explaining his stereotyping process; it is a rather lengthy document minutely covering the following steps of the method:

6 Et beatus is, qui non fuerit offensus in me.

7 Quum autem abiissent, cœpit Jesus dicere turbis de Johanne; Quid exiistis in desertum ad videndum? arundinem quæ à vento agitatur?

8 Alioqui, quid exiistis ad videndum? hominem qui vestibus mollibus vestitur? Ecce qui mollibus vestiuntur, *in* domo regum sunt.

9 Alioqui, quid exiistis ad videndum? Prophetam? Etiam dico vobis, & excellentiorem quàm Prophetam.

10 Ipse enim est de quo scriptum est; Ecce, ego mitto nuncium meum ante faciem tuam, qui diriget viam ante te.

11 Amen dico vobis, quòd non surrexit inter natos hominum, qui major sit Johanne Baptista; minor autem in regno cœlorum, major est eo.

12 A diebus autem Johannis Baptistæ, & usque nunc, regnum cœlorum cum violentia accipitur, & violenti rapiunt illud.

13 Omnes enim Prophetæ & Lex usque ad Johannem prophetaverunt.

14 Et, si vultis vos, recipite quòd is est Elias, qui venturus erat.

15 Qui sunt aures ut audiat, audiat.

16 Cui autem assimilabo generationem hanc? Similis est pueris, qui sedent in foro, & acclamant sodalibus suis,

17 Ac dicunt; Cecinimus vobis, & non saltastis: ululavimus vobis, & non planxistis.

18 Venit enim Johannes, qui non comedit neque bibit, & dicunt; Dæmonium est illi:

19 Venit filius hominis comedens & bibens, & dicunt; Ecce, homo edax & potor vini, & amicus publicanorum & peccatorum. Et justificata est sapientia à cultoribus suis.

20 Tunc cœpit Jesus exprobrare civitatibus illis in quibus editæ fuerant virtutes ejus plurimæ, neque conversæ fuerant.

21 Et dicebat; Væ tibi Corazin; Væ tibi Bethsaida: quoniam, si Tyri & Sidonis edi-

Giving a list of stereotype imposing furniture necessary for one page (an iron frame, and iron side-stick and foot-stick, an iron head, and two to four iron quoins, with four bevelled brasses, to give a slope to the edges of the stereotype plate).
Instructions for the burning of the gypsum.
Instructions for molding, pouring of the gypsum, etc.
Instructions for the dressing of mold, making it fit for being put in the oven to be dried.
Explaining the nature and the making of oven used for baking the molds.
Instructions for process of casting.

The process practiced in the stereotype shop of Stanhope and Wilson is described as the following: The face of the types set up in the form was first rubbed with fine olive or sperm oil, in order to prevent the adhesion of the plaster of Paris mold to the form. The types having ben set with high quadrates and spaces, they were plastered over the liquid gypsum (nine parts of plaster, finely ground in a semi-liquid state from admixture with seven parts of water) to the thickness of about one-half of one inch, so that a level cake was formed on the surface of the types. As soon as the plaster hardened, which it did almost immediately, the case was separated from the types, and on being turned up, showed a complete hollow or mold-like representation of the faces of the types and everything else on the page. Then the set-up types were of no further use, and were re-distributed. The cake was put into an oven and baked, like a piece of pottery. Next, it was laid on a square iron pan, having a lid of the same metal, with holes at the corners. The pan was then immersed in a pot of molten metal and being allowed to fill up by means of the holes, it was at length taken out and put aside to cool. On opening the pan, the metal had run into the mold side of the cake, and formed a thin plate all over, exhibiting the perfect appearance of the faces of the types on which the gypsum was plastered. These plates were

about one-sixth of one inch thick, and were printed from in the same manner as in the case of printing from types.

About the same time when Stanhope was engaged in his experiments, POTERAL, of Paris, created a stir in the printing world by announcing that he had invented a more simple method of stereotyping than any yet in use. A Commission of the National Institute of France was appointed to examine his claims. From its report it appears that Poteral had executed nothing according to his projected plan, which was in fact merely a modification of part of Herhahn's method. Poteral proposed to form matrices for casting hollow-faced types, instead of type in relief; to compose the pages with these types, and then to cast from them a stereotype plate, formed of compound metal. The commission's report was entirely unfavorable and the process was never put into practice.

In 1809, CHARLES BRIGHTLY, Printer of Suffolk, published a small pamphlet giving a detailed account of a method pursued by him in founding stereotype plates. The process resembled Stanhope's method considerably, possessing, however, greater simplicity in its arrangements. Other contemporary inventors were APPLEGATH and BRUNELS.

The Stanhope new and practical process of stereotyping, as well as stereotyping in general found a very divided reception. A serious drawback to the use of these first stereotype plates was their want of uniformity in thickness, which caused both labor and vexation in the printing; this and other minor defects disposed many of the old-fashioned pressmen to set their faces against the innovation. By some stereotyping was bitterly contested, by others lauded to the skies. In 1807, the April number of the "Monthly Magazine" (London) attacked stereotyping in the following terms:

"Stereotype printing has not been adopted by the booksellers of London, because it does not appear that more than 20 or 30 works would warrant the expense of being cast in solid pages; consequently the cost of the preliminary arrangements would greatly exceed the advantages to be attained.

On a calculation, it has appeared to be less expensive to keep certain works standing in movable types, in which successive editions can be improved to any degree, than to provide the means for casting the same works in solid pages, which afterwards admit of little or no revision. As the extra expense of stereotyping is in all works equal to the expense of 750 copies, it is obvious that this art is not applicable to new books, the sale of which cannot be ascertained. Altho these considerations have induced the publishers of London not to prefer this art in their respective businesses, yet it has been adopted by the Universities of Cambridge and Oxford; and from the former some very beautiful editions of Common Prayer Books have been issued to the public; probably the art of stereotyping applies with greater advantage to staple works of such great and constant sale, as prayer-books and bibles, than any other." This very disparaging statement was hotly contested by Mr. Wilson, Lord Stanhope's partner, in a lengthy article addressed to the London booksellers and printers.

Even after plaster of Paris stereotyping had been practiced on a relatively modest scale for almost twenty years, the opposition against the art had not yet abated.

Hansard, the celebrated London printer and writer on printing subjects, wrote in the year 1825: "No printer should stereotype who wishes his type to be a credit to his house. The wear of material in casting is miserable, the gypsum is at best a fine powder, and grinds away the edge and face of the letter when rubbed in with a brush, in a frightful manner. The letter can never be entirely freed from the plaster, and will present a very dirty appearance ever after."

Equally bitter in his condemnation of stereotyping was Johnson, printer and author of a celebrated book, entitled "Typographia" (1824). In this two volume work, Johnson devotes but a few meager lines to the subject of stereotyping. He writes: "We conceive that the inventor of stereotyping is not worth the pains of our tracing; and more particularly when we reflect that so many of our brethren who well deserve

(from their ability) a comfortable subsistence, and who ought to be enabled (from their profession) to move in a respectable sphere of life, are now through this process, reduced to a very humble pittance; thereby bringing the first art in the world down to the level of the lowest; and, at one season of the year, nearly one-half of the valuable body of men alluded to may be considered as destitute of employ on account of the standard works, which was the summer's stock work."

The plates made by the Stanhope plaster of Paris process were of wonderful depth, sharply cut and gave the very best impressions. There were, however, in the practical use of the plaster process many inconveniencing manipulations; the method is a slow one, causing great loss of time. The type becomes dirty, small specks of plaster adhere to them and necessitate cleaning before re-distribution of types. The sheet is smudged through the high spaces that are necessary with plaster casting. The most important drawback is that from the plaster matrix only *one* cast can be made.

All of the above cited inconveniences, drawbacks and criticisms of the plaster of Paris method of stereotyping led members of the trade to further experiments and advance in the art, the ultimate aim being to devise a stereotyping process which would eliminate these drawbacks and to make stereotyping simpler, cheaper and more practicable.

THE PAPIER MACHÉ OR WET MAT PROCESS

Thus, in the period between 1828 and 1829 the papier maché or wet mat process of stereotyping was invented. This invention represented a tremendous advance in the art of stereoptyping and up to this present day paper mats have dominated the art.

CLAUDE GENOUX, a French printer, is the inventor of the so-called "papier maché" (mashed paper) or "wet mat" method of stereotyping.

Some contemporaries claimed that an Italian, named VANONI, by trade a maker of plaster casts of statuary, in-

vented a system of forming molds for papier maché in London in 1846 and thus, indirectly, gave the idea for the invention of matrices from that material. Others claim that in 1840, six years prior to Vanoni's arrival in England, a patent was granted to POOLE, printer in London, for "improvement in casting for printing purposes"; and that the subject patented was the papier maché stereotyping matrix.

Genoux's patent upon papier maché matrices, however, was granted eleven years before Poole received his patent, and seventeen years before Vanoni was heard of. While Genoux was working as compositor in the printing establishment of Rusaud in Lyons, France, he conducted his experiments, made his invention and was granted a patent upon same on the 24th of July, 1829.

The text of the wet mat patent granted to Genoux by the French Government read as follows: "Patent Number 3965, granted for a period of ten years to Genoux (Jean-Baptiste) of Lyons, for a perfected process of stereotyping."

"The matrix which I have the honor of submitting to you is composed of seven layers of paper; the last, or uppermost layer is oiled and reddened (sanguiné). Between these layers I lightly apply by means of a brush a mastic composed of clay, hide-glue and a little oil. Any sort of mastic may be employed; I have adopted this special one on account of it being more economical."

"I place this combination of layers upon the type form and I make an impress with the aid of a roller, proceeding as in taking off a simple proof. I place the whole in the press and cause same to dry. After it is dried I paste a cardboard frame all around the back of the matrix in order to give more depth to the face of the type; thereupon I place it between two iron plates, upon which I have pasted several sheets of paper, there where the cardboard frame of the thickness which I desire to impart to the mold, has been applied."

"I pour the fused metal through a large aperture made in one of these plates, and thereupon the mold is perfect."

"My invention is entirely in the paper, being that without its help I cannot obtain anything perfect."

On the 30th day of August, 1836, a "patent for improvement containing additions" was granted to Rusaud of Lyons, purchaser of the first Genoux patent. The preamble of this document reads as follows:

"When Mr. Genoux ceded his process of stereotyping to Mr. Rusaud, his first tests were far from the hopes he had given birth to; a large number of plates could not be used, because they were badly executed, and very often the matrix broke at the first cast. Also, Mr. Genoux having sold his process in several localities, the purchasers did not succeed in deriving any benefit from their acquisition. Genoux personally came to Lyons two years after he had sold his process to Rusaud, well aware of the fact that the latter's foundry was the only place where Genoux's process had been put in practice and demanded to be admitted in Rusaud's shop in order that he might be initiated in the new discoveries and improvements made since the sale of the original process."

"It was due solely to his work, expenditure and perseverance that Mr. Rusaud has conquered over all difficulties and obtained satisfactory results."

The patent further contains minute and exact explanations of the improvements claimed to have been effected by Rusaud; for instance he employs a soft wooden roller in the stead of Genoux's hard wooden mangle; he constructed a novel oven to dry the mats before casting, made concave and convex plates, used woolen blankets, etc.

On the 26th of November, 1836, a second patent of improvements and additions to the original Genoux patent was granted to Mr. Landrin of Paris, another of the many purchasers of the original wet mat process. This amendment contains a number of improvements in the handling of wet mats.

Genoux sold his patent to his employer Rusaud, who in turn transferred it to another printer, J. A. Pelagaud by name. Genoux thereupon journeyed to Germany with the in-

tention of finding there a purchaser for his patent rights. An article appeared in 1834 in Dingler's Printing Trade Journal, reading as follows: "Monsieur Genoux, French book printer, gave a demonstration in Vienna a short time ago of his new method of printing with solid fixed types ('Stereotyping'), of which he is the inventor. In accordance with his invention, Genoux first prepared a material which he called 'flan.' This material was in form and thickness about that of a paper book cover. Into this material he made an impression of the form he had composed, thereby making a matrix. Into this seemingly very weak mold, he poured lead, thereby casting a metal plate of about the thickness of 40 to 45 one-thousandths of an inch. This plate was a reproduction in relief of the form impressed on the 'flan,' and was of greatest cleanliness and precision."

In 1834, the same year this article appeared, Genoux sold his patent rights to George Jacquet, owner of the royal-printing-establishment in Munich. Jacquet then advertised to the trade that he stood ready to sell, against payment of a honorarium, the necessary information regarding the manufacture of these "wet mats" to printers.

Although, compared to the old plaster process, this paper method of stereotyping did wonders as far as rapidity, cheapness and beauty of the plates were concerned, still it took a very long time before this process was universally acknowledged.

In fact, it was not until over seventeen years had passed since the granting of Genoux's basic patent that a master printer, TETIN by name, founded a stereotyping shop in Paris in 1846 using Genoux's invention, which, by the way, Tetin in due time greatly improved.

Genoux's method of stereotyping was to paste four or five sheets of dampened tissue paper lightly together on a sheet of plate-paper, lay same on the surface of the type, strike the laminated sheet with a heavy brush until the soft papier maché had taken an exact impression of the type. On this "flan" or matrix, as it was then called, a sheet of plate paper was spread

and beaten in by another application of the brush. This completed the matrix, which was then dried and hardened. Casts were taken from the mold thus obtained by simply placing it in a flask (flat caster) and pouring stereotype metal upon it by means of a ladle.

The advantages of Genoux's papier maché (wet mat) process presented over the plaster of Paris method were:— The comparatively short time it took to accomplish; that series of plates could be made from one and the same flan. (In the plaster process the mold is destroyed in releasing the "shell" or cast, therefore only *one* plate can be produced without remolding.) That the mold could be preserved indefinitely for later use, that molds could be packed and sent any distance without damage, and finally that the paper molds could be bent without damaging them.

The papier maché process of Genoux is the basis of all paper stereotyping, as it is practiced to this very day. It is unchanged in principle, although the materials used have been improved, certain drawbacks overcome, and the machines used for the different manipulations augmented and modernized.

The word *"flan"* is above used as a designation for a "papier maché" matrix. The term is attributed to Genoux, who employed same in his original patent, and also to James Dellagana, a Swiss stereotyper of London. The English phonetic form for this French word *"flan"* is *"flong."* The explanation for the word "flan" is that in Paris there exists a kind of pastry called "flan" made in layers, and which has the appearance of piled up, somewhat flabby, buckwheat cakes. The resemblance between a layer of such flabby cakes of "flan," and the pasted layers of the wet papier-maché mats, suggested the name for paper stereotype matrices. This name has, however, never been universally adopted, and is practically in disuse everywhere except in France and England. The generally employed term for a papier-maché mat is "wet mat."

Up to approximately the year 1852, stereotyping as practiced by the various methods described so far in this booklet, was employed solely in the printing of books. In the

above year Genoux's papier-maché or wet mat stereotyping was adopted by the French daily newspaper "La Presse" in Paris. This step opened an immense and fertile field to the art of stereotyping.

THE HISTORY OF THE NEWSPAPER

Before continuing our compilation of the different steps in the art of stereotyping, a few remarks pertaining to the history of the newspaper will be of interest.

A newspaper in its modern acceptation can only be properly dated from the time when in Western Europe the invention of printing made a multiplication of copies a commercial possibility.

We find news in a form similar to what we call a newspaper in the times of the Assyrians and Egyptians, and later on in the Roman Empire. Julius Caesar ordered a regulated publication of short hand-written records, called *Acta Senatus*, of the courts of law and of public assemblies. Another publication, called *Acta Diurna* (daily acts), recorded descriptions of public works, buildings in progress; lists of deaths, births and marriages; trials for divorces, which were of frequent occurrence among the Romans. These hand-written publications were made accessible to the people through posting of same on public buildings.

Soon after the Chinese had invented their method of block-printing, they established an official Gazette and printed it in Pekin. This publication is still in existence and is called the "Court Transcript."

There is, however, no uninterrupted connection between these different hand-written or printed publications and the real beginning of newspaper makings; these date from the beginning of the 16th century.

The ancestors of the modern newspaper are four-fold:— *troubadours* or *wandering minstrels*, the *leaflet*, the *letter* and

the so-called *market-relations* or statements of an isolated piece of news.

The *troubadours* have been called the wandering journalists of the Middle Ages. They roamed through many countries, visiting the courts and castles of the mighty, and in song and speech they brought to the world of those days what we moderns glean from our daily newspapers. They gave the best and the newest in the sphere of music and poetry, and being widely travelled personages, they desseminated knowledge of all events, big and small, that happened in the cities and countries they had roved in. This news was delivered by the minstrels in epigrammatic, vigorous songs, which were often memorized by the hearers and carried further.

After the art of printing from engraved wooden-blocks was invented, the next step was to disseminate news through *hand-bills* or *leaflets*. The contents of such leaflets were made up from the momentous events, for example, the dangers of the Turkish invasion of the Occident, the acts and utterances of emperors, rulers and great men, great ceremonies, finances, battles. Also short, vivid accounts of occurrences of Nature, pestilence, crimes, executions, etc. During the period of the Reformation, the ninety theses of Luther were printed as leaflets and distributed all over the country.

A very important member in the chain leading to the newspaper was the *written letter*. In the Roman Empire the high officials in the provinces had slaves or liberated slaves in Rome send to them regularly reports by letter covering all political and social events of the empire. In the Middle Ages, princes, monastaries, city administrations, learned men, etc., had writers of occupation report to them on various topics. Then scribes appeared who reported only on commercial matters of importance; these men had as seat of their activities great commercial centres, Venice, Ulm, Rome, Antwerp, Augsburg.

In due time these letter-writers dropped the form of addressed letters and issued written circulars, becoming thus less personal in their reports. In the 16th century scribes began the practice of selling accumulated news in copies. The men

who conducted these flourishing news agencies were called *scrittori d' avisi* (writers of news) and formed the first reporters guild.

The next step was a certain regularity of making and delivering such news information. The first printed newssheets, which through the combination of giving news and giving same regularly, resembled the present day newspaper closely, were the so-called *market-reports* or "relations". These publications were issued semi-annually for distribution at fairs held at the commercial centers and contained all important news, covering the past six months. The inventor of this system was Michael von Aitzing, who in March, 1583, issued the first *relatio historia* (historical report).

July, 1588, an English newspaper appeared intermittently, called *"The English Mercuric,* for the prevention of false reports, imprinted and sold by the Queen's printers, Field and Barker, London."

Within a few years London had no lack of such Mercuries, Corantos, and Gazettes. Many imitators followed on the continent and as next step there appeared the weekly newssheet, of which one, issued in Strasbourg in 1609 carried the following title: "Account of all capital and memorable histories which on and off have occurred in Upper-and-Lower-Germany, also in France, Italy, Scotland, England, Spain, etc., etc., in this year 1609. All newes shall, as I may obtain and collect same, be set up in print."

The FIRST ENGLISH newspaper in the present day sense of the word was established in London by NATHANIEL BUTTER, in 1622. It was a small quarto of eighteen pages, called the "CERTAIN NEWES OF THE PRESENT WEEKE". The editor solicited subscribers by the following advertisement:

"If any *gentleman,* or other *accustomed* to the *weekly* relations of news, be desirous to continue the same, let them know that the writer, or transcriber rather of this *newes,* hathe published two former *newes,* the one dated the second, the other the thirteenth of August, all of which do carry a like title, with the arms of the King of Bohemia on the other

side of the title page, and have dependence one upon another: which manner of writing and printing he doth purpose to continue weekly, by God's assistance, from the best and most certain intelligence. Farewell, this *twenty-third* of August, 1622.' This was the first English *newspaper,* because it was the first publication of news which the editor publicly proposed to continue *regularly*.

Very shortly afterwards a number of "Weekly News Books" put in their appearance, such as "News from Flanders", "News from Italy", etc. On March 7th, 1649, in Number 7 of "The Impartial Intelligencer" there is to be found the first regular advertisement. It is from a gentleman in Candish in Suffolk, from whom two horses had been stolen.

France printed its first weekly newspaper in 1632. It was established in Paris by DR. THEOPHRASTUS RENAUDOT, a physician, famous for his skill in collecting gossip and news to amuse his patients. Encouraged by the reception his news received from not only clients but also from others, he realized it would be advantageous to print periodically and sell his accumulations of news. He obtained a sole privilege from Cardinal Richelieu for publishing the "Paris Gazette" and the first number appeared in April, 1632. King Louis XIII was a frequent contributor to the "Gazette", taking his little paragraphs to the printing office himself and seeing them set up in type. Renaudot asked 6 centimes for each issue. His children and grandchildren kept up the publication; in 1765 the paper was the first to bring stock exchange quotations and in 1792 also the first newspaper to publish theatrical advertisements.

The first *daily* newspaper appeared in Leipsig, Germany, in 1660, the same still being published. In 1695 the censure fell in England and in 1709 the first daily newspaper was published in London, called the "Daily Courant". In 1777 the first daily in France was issued, the "Journal de Paris", and in 1778 the first Sunday newspaper, Johnson's "Sunday Monitor", in London.

One kind of a newspaper must yet be recorded, namely

the "spoken newspaper"; news read in church to the congregation, or after church on the public square by the town crier.

The first newspaper published in North America was "The Newsletter", founded in 1704 by a Scotchman, JOHN CAMPBELL, at that time postmaster and bookseller in Boston. The first issue was "From Monday, April 17th, to Monday, April 24th, 1704," and the newspaper was printed by BARTHOLOMEW GREEN in a small wooden building on Newberry Street. The second paper was "The Boston Gazette", which appeared in 1719, and the third was the "New England Courant", of which the first issue was made on the 17th of August, 1721. This newspaper was published by JAMES FRANKLIN, the elder brother of Benjamin Franklin. James' friends shook their heads over his project, being of the opinion that one newspaper was all that America, with a population of 400,000, could support. Benjamin, 15 years old, set up type, ran the press and delivered the papers. The first newspaper in New York was published by WILLIAM BRADFORD on the 8th of November, 1725, and was "The New York Gazette". The oldest newspaper in America published daily is the "Hartford Courant".

NEWSPAPER STEREOTYPING

A man who was prominent in the development of the papier-maché or wet mat method of stereotyping for newspapers was a Swiss printer, JAMES DELLAGANA. He learned stereotyping according to Genoux's patented process in Paris, and set up a stereotyping shop in London. In the year 1855 he was granted a patent for casting plates type-high, hitherto all stereotype plates were only about ⅛" thick. He then invented a system for casting plates hollow inside, but still type-high, thus making the plates lighter and more convenient to handle. In 1861 he invented a molding press, which was later universally adopted, and known as the *roller* or calender.

In 1860 JAMES WOOD of London invented a new cast-

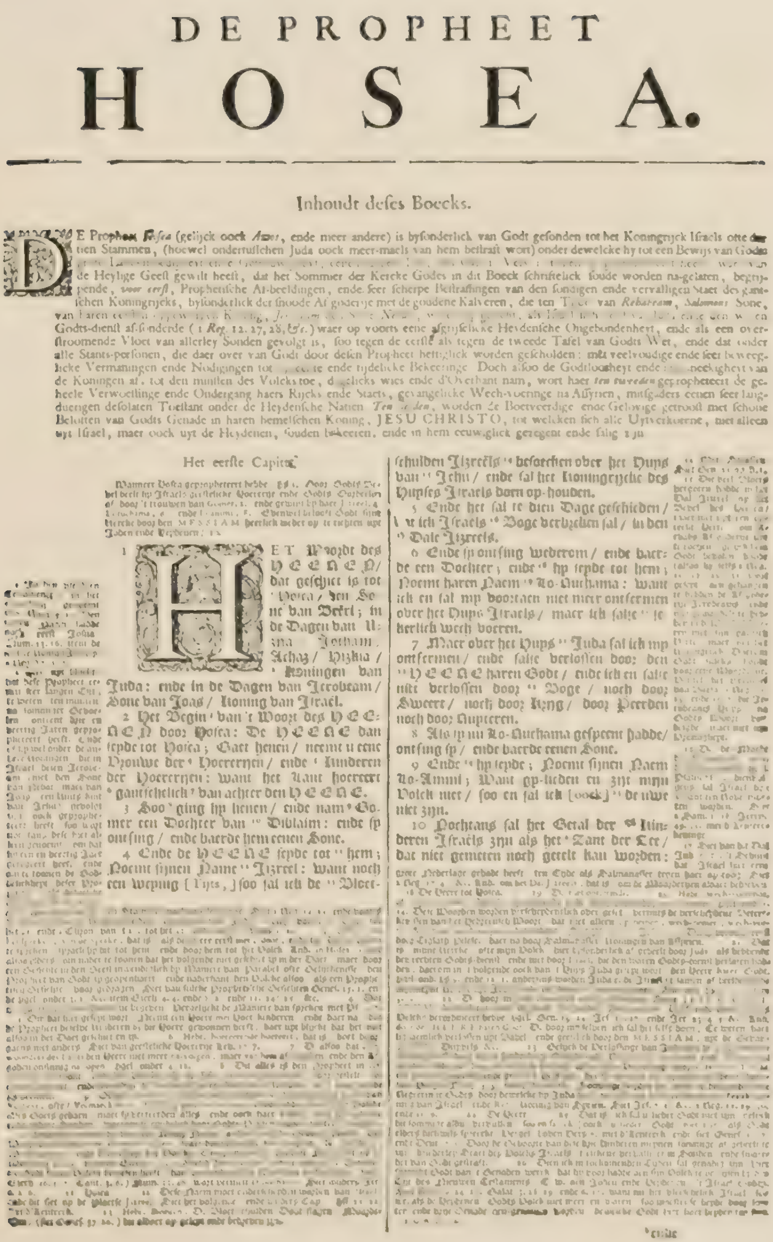
ing box which cast the column plates flush with the type, ready to be used in a newspaper form, alongside movable type matter.

Dellagana prospered and made plates for the celebrated daily newspaper, "The Times" of London, started by John Walter on the 1st of January, 1785, under the name "The London Daily Universal Register printed Logographically" (Logography is "word-printing"). On its 940th issue it was changed to "Times."

At the end of the Crimean War, from 1856 to 1859, the "Times" conducted a series of experiments with stereotyping with the wet mat process, the object in view being to get as many good plates in as short a space of time as possible. Every advance in this direction was communicated to the trade as fast as made. A large number of daily newspapers were encouraged by the example set by the "Times" to adopt stereotyping and the practice brought on improvements in the process as well as in the machinery and equipment used therein. In 1860 the Times was so far advanced that it went over to the wet mat method entirely. The first plates were cast type-high in single columns; later full pages were cast in curved form to fit the cylinders of the rotary presses in use at that time, and finally in 1863 the casting of semi-cylindrical plates was accomplished and the problem of rapid newspaper printing was solved. The first semi-cylindrical plates were cast in 1854 by an American, George Craske of New York.

In 1863 JOHN C. MACDONALD and JOSEPH CALVERLY, employees of the "Times", were granted a patent for "Improvements in the manufacture and application of printing apparatus." The patentees employed the ordinary wet matrix method of stereotyping, but they cast the plates in a tubular form, cylindrical on the external surface. In 1866 they were granted additional patent on further improvements.

From now on the wet mat commenced its triumphal way in newspaper offices and up to this day, little changes have been made in the original method of using the wet mat process. Many were the experiments made, but the basic ideas have



DE PROPHEET
HOSEA.

Inhoudt deses Boecks.

DE Propheet *Hosea* (gelijck oock *Amos*, ende meer andere) is bysonderlick van Godt gesonden tot het Koningrijck Israels ofte der tien Stammen, (hoewel ondertusschen Juda oock meer-maels van hem bestraft wort) onder dewelcke hy tot een Bewijs van Godts [illegible] de Heylige Geest gewilt heeft, dat het Sommier der Kercke Godes in dit Boeck schriftelick soude worden na-gelaten, begrijpende, *voor eerst*, Prophetische Af-beeldingen, ende seer scherpe Bestraffingen van den sondigen ende vervalligen Staet des gantschen Koningrijcks, bysonderlick der snoode Af-goderije met de goudene Kalveren, die ten Tijde van *Rehabeam*, *Salomons* Sone, [illegible] Godts-dienst af-sonderde (1 *Reg.* 12. 27, 28, &c.) waer op voorts eene afgrijselicke Heydensche Ongebondenheyt, ende als een overstroomende Vloet van allerley Sonden gevolgt is, soo tegen de eerste als tegen de tweede Tafel van Godts Wet, ende dat onder alle Stants-personen, die daer over van Godt door desen Propheet hettiglick worden gescholden: met veelvoudige ende seer beweeglicke Vermaningen ende Nodigingen tot [illegible] ende tijdelicke Bekeeringe. Doch alsoo de Godtloosheyt ende [illegible]neekigheyt van de Koningen af, tot den minsten des Volcks toe, dagelicks wies ende d'Overhant nam, wort haer *ten tweeden* geprophetecert de geheele Verwoestinge ende Ondergang haers Rijcks ende Staets, gevangelicke Wech-voeringe na Assyrien, mitsgaders eenen seer langduerigen desolaten Toestant onder de Heydensche Natien. *Ten derden*, worden de Boetveerdige ende Gelovige getroost met schone Belotten van Godts Genade in haren hemelschen Koning, JESU CHRISTO, tot welcken sich alle Uytverkorene, niet alleen uyt Israel, maer oock uyt de Heydenen, souden bekeeren, ende in hem eeuwiglick gezegent ende salig zijn.

Het eerste Capittel.

Wanneer Hosea geprophetcert hebbe. vs 1. Hoe Godts Tevel heeft hy Israels geestelicke Hoererije ende Godts Oordeelen af door 't trouwen van Gomer, 3. ende gewint by haer Jisreel, 4 Lo-ruchama, 6 ende Lo-ammi, 8. Evenwel belooft Godt sijne Kercke door den MESSIAM heerlick weder op te richten uyt Joden ende Heydenen, 10.

1 HET Woordt des HEEREN, dat geschiet is tot Hosea, den Sone van Beeri; in de Dagen van Uzia, Jotham, Achaz, Hizkia, Koningen van Juda: ende in de Dagen van Jerobeam, Sone van Joas, Koning van Israel.

2 Het Begin van 't Woordt des HEEREN door Hosea: De HEERE dan seyde tot Hosea; Gaet henen, neemt u eene Vrouwe der Hoererijen, ende Kinderen der Hoererijen: want het Lant hoereert gantschelick van achter den HEERE.

3 Soo ging hy henen, ende nam Gomer een Dochter van Diblaim: ende sy ontfing, ende baerde hem eenen Sone.

4 Ende de HEERE seyde tot hem; Noemt sijnen Name Jizreel: want noch een weynig [tijts,] soo sal ick de Bloetschulden Jizreels besoecken over het Huys van Jehu, ende sal het Koningrijcke des Huyses Israels doen op-houden.

5 Ende het sal te dien Dage geschieden, dat ick Israels Boge verbreken sal, in den Dale Jizreels.

6 Ende sy ontfing wederom, ende baerde een Dochter; ende hy seyde tot hem; Noemt haren Naem Lo-Ruchama: want ick en sal my voortaen niet meer ontfermen over het Huys Israels, maer ick salse seer lick wech voeren.

7 Maer over het Huys Juda sal ick my ontfermen, ende salse verlossen door den HEERE haren Godt, ende ick en salse niet verlossen door Boge, noch door Sweert, noch door Krijg, door Peerden noch door Ruyteren.

8 Als sy nu Lo-Ruchama gespeent hadde, ontfing sy, ende baerde eenen Sone.

9 Ende hy seyde; Noemt sijnen Naem Lo-Ammi; want gy-lieden en zijt mijn Volck niet, soo en sal ick [oock] de uwe niet zijn.

10 Nochtans sal het Getal der Kinderen Israels zijn als het Zant der Zee, dat niet gemeten noch getelt kan worden:

Facsimile Page of First Stereotyped Bible (1701)

remained the same up to the advent of the dry mat. The wet mat processes had many drawbacks, and of the many experiments to remedy these, the most interesting ones were made in America and merit being described.

FURTHER EXPERIMENTS IN THE ART

An improvement on the wet mat stereotyping process embodying an idea of using dry material was made in 1863 by ALFRED VINCENT NEWTON, an English mechanical draughtsman. He was granted a patent for "an improved mode of and apparatus for producing stereotype plates." His application first describes the prevailing process as consisting of several sheets of glued paper, beaten in with a brush while moist, then heated to dry; in his improved process the molding material used in soft paper or *dry pulp* of such thickness that under pressure a sufficient depth will be ensured to hollows or counters to produce a good casting. To obtain the mold a sheet of dry paper or paper pulp of soft or spongy character is laid on the form of type to be copied and upon the layer of paper a sheet of steel or brass or India rubber is placed and the whole is passed between pressing rollers which may be covered with rubber. A matrix is thus produced and from it a stereotype plate is obtained in much less time than by the old wet mat process.

ALFRED LEIGHTON, a color printer in London, took out a patent in 1864 for improvements in the construction, manufacture of printing surfaces in relief. The novelty of his invention consisted in the fact that these surfaces were elastic, being made of an india-rubber compound and vulcanized in the molds.

A celluloid process of stereotyping was invented by a Frenchman, M. JANNIN, in 1880, as a substitute for metal in the casting of plates. The composition had the same consistency as putty. The mixture is spread upon a thin iron plate to a thickness of $\frac{3}{8}''$, and a piece of blotting paper is pressed over the whole to absorb the superfluous glycerine. This is then placed on the type face downward, subjecting

same to gentle pressure in a press, and applying a slight heat to the iron plate. After about 4 minutes the composition is hardened and lifted from the form. Now a hot press, (steamtable) is necessary. The matrix now being ready to take casts from, is laid upon the table of a hot press, (steamtable) and a piece of celluloid of the same size on the top. The head of the press is heated by steam, screwed down on the celluloid which is thus softened. Great pressure is applied whereby the celluloid is forced into every part of the matrix whereupon cold water is admitted into the press, hardening the celluloid. Then the cast is easily removed from the matrix and trimmed, and is immediately ready for use. This operation of this process took a little less time than the papier-maché method, but it was in actual practice for only a short time, then it was discarded and forgotten.

A further application of the art of stereotyping which, while it did not involve any new invention or any appreciable modification of the wet mat stereotyping method, greatly enlarged the scope of the stereotyping business was the introduction of the so-called auxiliary newspaper or syndicate service. News matter was made up in a central office, casts taken and the plates thus made sent to various newspapers throughout the country. They thereby did not need to go to the expense of original type-setting of the material submitted. In 1858 Messrs. ISAAC HEYES and SAMUEL HARRISON of Sheffield, England, started this business on a large scale and supplied a great number of newspapers with stereotype columns. Later on, the heavy casts were not sent out any more, but the matter was molded on paper mats and these sent out.

During the Mexican war, when President Polk's message to Congress was released to the newspapers, ANDREW JACKSON AIKENS of Vermont requested a Boston paper which had already set up the message in type, to send him a number of impressions. Aiken then filled in the blank sides of these sheets with local news. This was the first attempt made in America in ready-print service. In 1851 HAGE-

DORN BROTHERS, publishers of the "Staten Islander", received ready-print from the New York "Sun". Thereupon in 1861 ATWOOD and RUBLEE of the "Madison Daily Journal" started a ready-print service to a number of affiliated papers, thereby constituting the first commercial auxiliary newspaper service. In 1865 ANSEL N. KELLOGG of Chicago was the first in America to supply ready-print as an independent industry. To quote Elmo Scott Watson, "in November, 1875, the American Printers' Warehouse, controlled by the George P. Rowell and Company Advertising agency, announced a new process of stereotyping and began offering more timely matter in this service in the form of a New York news letter in addition to such feature material as wit and humor, agricultural, general religious news, home circle, short sketches and miscellany."

The introduction of stereotype plates into the auxiliary plan met with some of the prejudice encountered by ready print at its inception. Publishers who had been suspicious of the use of ready print were also opposed to plate matter for no reason apparently except a sense of consistency in opposing all innovations in their craft. For those with the "all-home-print" fetish, it meant adding another word to their vocabulary of scorn for users of auxiliary service. "Boiler plate", they called it, with the same derogatory imputation as that conveyed by the term "patent insides", and editors who filled up their papers with plate matter cut to fill their needs were said to "edit their papers with a saw."

In 1880 the WESTERN NEWSPAPER UNION was founded by George A. Joslyn, (in 1923 this institution had 14,273 customers on its books). Other important present day syndicate concerns are: Central Press Association, Chicago Tribune Newspaper Syndicate, Johnson Feature Syndicate, King Features Syndicate, International Syndicate, Ledger Syndicate, Metropolitan Newspaper Service, McClure Newspaper Syndicate, Newspaper Enterprise Association (NEA), New York World Syndicate, Universal Feature Service (Hearst).

Chapter Three

STEREOTYPING IN AMERICA

The first printing in America was done in the year 1540 by the Jesuits in Mexico, the first book being a religious work entitled "A Manual for Adults."

The first printing press in the United States was erected and operated in Cambridge, Massachusetts, in 1638, under the charge of STEPHEN DAYE, and the first book he published was the Bay Psalm Book in 1640. For this press the colony was mainly indebted to the Reverend JESSE GLOVER, to whom some gentlemen of Amsterdam also gave "towards furnishing of a printing press with letters, forty-nine pounds and something more."

The first type foundry in America was established in 1735 by Christopher Sauer or Sower of Germantown, Pennsylvania. In 1775, Benjamin Franklin brought from Europe to Philadelphia the materials for a type foundry; little use, however, was made of them. Then John Baine, a Scotchman, sent tools for a foundry to this country, the business was started, but ended in 1790. In 1796 a type foundry was started in Philadelphia by Archibald Binny and James Ronaldson of Edinburgh, and in 1811 Elihu White established a type foundry in New York. D. & G. Bruce following in the same city in 1813. Binny perfected the matter of type founding of that period and his casters cast 6,000 letters per day per caster.

In 1745, an attempt at stereotype printing was made in Philadelphia by BENJAMIN MECOM, nephew of the great Benjamin Franklin. Mecom cast plates for several pages of the New Testament and made considerable progress towards the completion of the book, but he never finished it. In 1804, before the introduction of stereotyping into this country, MATHEW CAREY, the well-known enterprising publisher in Philadelphia, had the Bible in quarto set up entire, and regularly imposed in chases, to print from at convenience, according to the demand for the volume. The type was cast

by Binny & Ronaldson. Stereotyping would have saved a vast proportion of the immense outlay required to carry out the scheme, which, nevertheless, even under these circumstances, was doubtless highly remunerative. The weight of type must have amounted to 25,000 pounds, to say nothing of the number of chases and column rules required.

There are conflicting statements as to whom belongs the honor of having first introduced stereotyping in America. It has been claimed that an Englishman named JOHN WATTS was the first, arriving in New York from London, and starting a printing shop at 15 Murray Street in 1809. Watts spoke French and it appears that the stereotyping process he used was a combination of the Didot and Stanhope systems. In 1812 he made stereo plates, and in 1813 a book was published entitled: "The Larger Catechism. The first book ever stereotyped in America. Stereotyped and printed by J. Watts and Co., New York. June, 1813". In 1815 he moved his little plant to 154 Broadway. 1816 his name disappeared from the City Directory, he having sold his foundry to B. and J. Collins, a couple of Quaker printers. Watts left America and was traced to Austria where from 1820 on he conducted a stereotyping shop until his death.

In 1810 the "American Medical and Historical Register" printed an original paper written by LIEUTENANT-GOVERNOR DR. COLDEN concerning a new method of printing. A letter contained in the same issue written by Dr. Benjamin Franklin to Dr. Colden attributes the new method to Herhahn of Paris. In this paper Watts is mentioned as a stereotyper doing business in New York.

From reliable (Ringwalt) data it appears to be certain that to DAVID BRUCE, a Scotchman by birth, (born 1770, died 1857) belongs the honor of introducing stereotyping into America. In the year 1812 he visited England, and becoming acquainted with the success of the experiments in stereotyping then being made by Earl Stanhope, Bruce acquired by purchase a general knowledge of the art, and in 1813 brought it to this country. Associated with his brother

George, under the firm name of D. & G. Bruce, the brothers commenced the business in the city of New York. Meeting with many obstacles in this untried mechanical business, the Bruces made the most strenuous efforts to introduce and perfect the new art. Their ingenuity, resolution, and skill finally triumphed over adverse circumstances; in 1814 the first work stereotyped in America, a New Testament, was completed.

In the year 1815, JEDEDIAH HOWE, of Connecticut, hearing of the success of the Bruce brothers in the newly-invented art, came to New York and commenced a stereotype foundry on Thomas Street. Mr. Howe obtained his fair proportion of the limited and uncertain stereotyping of that early day. But in the course of eight years other foundries started, and an exceedingly keen competition followed. Mr. Howe removed his establishment to Philadelphia in 1823. Lawrence Johnson was already there, having commenced a stereotype foundry about the year 1820. The publishers of Philadelphia, had previous to the arrival of Mr. Johnson, sent their orders for the few books they ventured to subject to this process to the stereotype founders of New York. Bibles and school-books were the first to be stereotyped, and then gradually came books of great and continued popularity, including the English classics in prose and verse, and the books of popular authors like Washington Irving and J. Fenimore Cooper. The slow and cautious manner, however, in which American publishers availed themselves of this new invention was rather discouraging to the new beginners. Gradually, however, the booksellers were led into stereotyping, though at first not very profitably; for the first large work stereotyped by J. Howe, for the W. W. Woodward-Scott's Commentary on the Bible, in five quarto volumes, proved so heavy an undertaking that Mr. Woodward broke down under it, and left the plates on the hands of Mr. Howe.

On the death of Mr. Howe in 1834 JOHN FAGAN, who had been employed in the stereotype foundry for some time, purchased, enlarged, and continued the establishment. Gradually the business increased, until almost every class of

books was included. The cost was diminished also, as the competition of young and enterprising stereotypers caused a considerable narrowing of the profits, and induced a great extension of the new art.

Successive steps in the advancement of stereotyping contributed much to recommend its use; and even periodical journals came to be stereotyped. The rapidly increasing readers of newspapers had so multiplied the subscribers to the daily press that even the improved presses, aided by steam-power, were inadequate to the printing of the numerous impressions within a reasonable time. This necessity brought forth its appropriate invention; for now came forth Hoe's improved cylinder press, which dispensed with the flat form, and permitted type or a stereotype plate to be curved around a cylinder, and thus printed from with unprecedented rapidity. Soon the type for this purpose gave way to the stereotype plate, cast by the quick process of papier maché molding, and bent around the cylinder with certainty and facility.

The first set of stereotype casts of a Bible sent from England to Philadelphia, for one of the religious societies of that city, occupied the entire side of a moderate-sized room; and if the stereotype plates at present in the large cities were to be stored in this old-fashioned way, entire blocks of warehouses would be needed for the purpose. Celluloid stereotype plates made according to the above mentioned French Jannin process were then introduced in the U. S. A.; the plates were very thin, and blocked. In 1885 one foundry in New York, corner of Fulton and Gold Streets, made these plates. Another one in Ohio practiced the making of celluloid plates, until a number caught fire and the plates burned up.

Before the curved stereotype plate put in its appearance, Mr. Caslon IV of the celebrated London firm of type-founders, patented type for setting around a cylinder, for rotary printing. It was one-third ordinary height, cast wedge-shaped, larger at face than at foot. It was made especially for a newly constructed press, the Nicholson cylinder press, but was never used. In 1847 Richard M. Hoe

invented the type revolving press—curved saddles, fastened around the cylinder,—in which wedge-shaped column rules and curved cross rules, dashes and brasses were used. It was not a perfecting press, but was built with from four to ten cylinders, with a feeder for each. The speed was 2,500 for each cylinder.

The next step forward was the invention of making curved stereotype plates. The honor is due to an American engineer. In 1850 CHARLES CRASKE, of New York, then 28 years old, introduced papier-maché stereotyping into America. Craske cast his first curved plate in 1854 for the "New York Herald". In 1859 Dellagena had, as previously noted, produced curved plates for the London "Times", but he cast each column separately, after which they were locked on the turtles, while Craske's plate was of the entire page, identically as done at the present day. Craske cast the curved plate as follows: the mat was fastened in a casting mold or box curved to the circumference of the cylinder of the press, and molten stereotype metal (a softer form of type metal) was poured upon it. During the process the box stood upright, but while the mat was being placed into position, it lay horizontally, a swivel mounting enabling it to be readily turned.

The wet mat method of stereotyping was by this time firmly established in the United States and many were the efforts to improve, simplify or even do away with the papier-maché process. A few are worthy of mention.

PROGRESS IN WET MAT STEREOTYPING

WILLARD S. WHITMORE, of Washington, D. C., in 1881, in his invention relating to paper molds or martices for casting stereotype plates, proceeded as follows: Instead of making his mat up of alternate layers of unsized paper and sheets of tissue paper pasted together and in order to remedy the drawbacks of pulling in wet mats, Whitmore constructed a new composite mold, which was formed of a sheet of unsized paper, covered same with a layer of paper pulp, which had

NOUVEAU

STEREOTYPE

EN MATRICES DE CUIVRE.

A PARIS,

DE L'IMPRIMERIE DE L. E. HERHAN.

IX. — 1801.

Romani, domi militiæque intenti, festinare, parare; alius alium hortari; hostibus obviàm ire; libertatem, patriam, parentesque, armis tegere. Pòst, ubi pericula virtute propulerant, sociis atque amicis auxilia portabant: magisque dandis quàm accipiundis beneficiis amicitias parabant.

Imperium legitimum, nomen imperii regium habebant. Delecti, quibus corpus annis infirmum, ingenium sapientiâ validum, reipublicæ consultabant: hi, vel ætate vel curæ similitudine, PATRES appellabantur. Pòst, ubi regium imperium, quod initio conservandæ libertatis atque augendæ reipublicæ fuerat, in superbiam dominationemque convertit; immutato more, annua imperia, binosque imperatores sibi fecêre. Eo modo minumè posse putabant per licentiam insolescere animum humanum.

VII. Sed eâ tempestate cœpêre se quisque extollere, magisque ingenium in promtu habere. Nam regibus boni quàm mali suspectiores sunt, semperque his aliena virtus formidolosa est. Sed civitas incredibile memòratu est, adeptâ libertate, quantùm brevi creverit: tanta cupido gloriæ incesserat! Jam primùm juventus simul laboris ac belli patiens erat, in castris per usum militiam discebat: magisque in decoris armis et militaribus equis, quàm in scortis atque conviviis, lubidinem habebant. Igitur talibus viris non labos insolitus, non locus ullus asper aut arduus erat: non armatus hostis formidolosus: virtus omnia domuerat. Sed gloriæ

Facsimile of Title Page of a Book Stereotyped in Paris in 1801 (Herhan's Process)

never been set by drying. He formed the plastic pulp by adding to it a watery state, a little glue, gum or other adhesive agent. The water was then squeezed out by pressure, when the pulp was laid upon a heavy piece of unsized paper which had received a coating of paste made of starch, flour or some albuminous substance and allowed to stand a while under a light pressure, so that the paste could combine more thoroughly with both the pulp or plastic and the heavy stereotype paper. The advantage Whitmore claimed for his mat was greater plasticity, toughness, and economy, requiring but one layer of pulp, while the old wet mat required three or four layers of paper.

Benjamin B. Huntoon of Louisville, Kentucky, in 1881 took paper from the common or poorest stock, but of extra thickness; and in order to prepare it for his purpose, he first subjected it to heat sufficient to char or carbonize it, or by dipping it (a sheet at a time) in molten metal, or by baking it (after slight dampening) upon a steam-chest under slight pressure, or by moistening it with acid, and when this moisture had sufficiently evaporated to leave it but slightly soft and pliable it was ready to receive the impression, which was made by passing it through an ordinary printing-press, provided with suitable type, in a cold state, either with or without a paper backing; but if a backing was used it was only intended to assist in removing the matrices from the type. The process of drying was accomplished by means of a steam-heated surface.

George Damon and Elias Peets in 1888 produced a metal-faced mat with a papier-maché backing. Their method in detail was as follows: by means of the type they first took an impression in papier-maché, thus forming a matrix. Stereotype metal was then poured into this matrix and an ordinary stereotype plate formed. The plate was then coated with melted wax, and before the wax had entirely hardened, powdered plumbago was dusted over the whole surface. The plate thus prepared was immersed in a copper solution and a film of copper deposited upon its face. The plate

was then placed upon a beating table and a sheet of dampened stereotype-paper laid over it, which was beaten into the irregular copper surface. Thereupon a thin coating of pipe-clay was spread over the entire surface, which was then removed from the depressed surfaces (which occur where paragraphs or blanks are found in the type) and into these depressions were then placed small strips of compressed, properly cut stereotype-paper and over the whole were then laid in succession and beaten in several additional sheets of moist stereotype paper. This plate was then smoothed and dried, when the copper coating with its backing of paper, was stripped from the plate and was in condition to be used as a matrix, from which any number of stereotype plates were produced.

CHARLES M. GAGE, of Massachusetts, invented a rather novel mat in 1888. He destroyed the most essential property, the basic fundamental of a paper mat, namely its elasticity. In accordance with his invention his matrix-board was made of sheets of paper composed of vegetable fibre, preferably two or more of these sheets being heated with a solution composed of shellac, borax and water. The sheets of paper were dipped into this solution and thoroughly dried. Hereby the elasticity of the fibre was destroyed. Then there was pasted to this matrix board a finishing-sheet of paper made of a strong long vegetable fibre, which had been coated with paraffine or wax. The non-elasticity of the matrix, permitted, according to Gage, of maintaining a perfect impression for an indefinite period of time.

WALTER B. CARR and AUGUSTUS G. FRENCH, of St. Louis, invented certain new improvements in matrix-boards in 1892. Their invention made to dry a wet mat without heating the type, consisted in forming a matrix of semi-porous blanket, and forming an impression sheet on one of its faces. Their mat consisted in only one sheet of Manila or other ligneous fiber, one side of which was finished, so as to give it the properties of woven paper, while the other side was left in its original semi-porous state, thus making the impression sheet a part of the blanket, which parts up to the time had

been applied separately in use. No paste was necessary, as the mat consisted of only one sheet.

Louis G. Timroth of Brooklyn invented in 1896 a chemical paste which was to do away with one of the great drawbacks of the wet mat. He claimed that his mat could be rolled for mailing, be stored and kept for an indefinite length of time without liability of souring or otherwise deteriorating. He also claimed that no backing was necessary and that his mat permitted reproduction of the finest possible lines, such as were found in half-tones, which could not be produced by methods hitherto employed. His paste consisted of water, alum, flour, ocher, rosin, ground cloves, sugar starch, gum-arabic and white glue.

When during this period the dry mat cold stereotyping idea was being discussed, the advantages claimed for the same led to many experiments in rapid drying of wet mats on the part of stereotypers who were opposed to the new cold process.

It was tried to produce quickly drying paper matrices by means of easily volatile fluids, for instance, alcohol, but this method had the drawback that the alcohol of the wet mat evaporated too soon, and consequently the mat became dry, before it reached the steam table, whereby it lost its binding power and instead of forming a solid coherent mass, it was loose and liable to be separated sheet layer for sheet layer.

A number of experiments were made to shorten the stereotyping process, one of which was rather novel. In 1884, Charles A. Skene, of Kansas, invented a process to obtain stereotype-plates for printing purposes direct from matrices made by telegraph—or type-writing machines, and thus obviate the necessity of having to prepare type-forms in order to obtain a cast, thus saving the time, labor, and expense of composition, distribution, and make-up that are necessary prerequisites to the operation. In order to carry his process into operation, Skene took a thin sheet of soft paper and coated it evenly on both sides with a brush that was dipped into a pasty mixture of glycerine and plumbago. When the paper had thoroughly absorbed the mixture, it was passed between

heated rollers until its surfaces became perfectly smooth. The paper so prepared was placed in a common type-writing machine, and the writing proceeded with as upon ordinary paper. Skene expected the types to make impressions on the paper sufficiently deep to form a mold or matrix in which a stereotype plate could be cast in the ordinary manner for use on an ordinary printing-press. He stated that "it will be obvious that a telegraph printing machine may be thus employed in preparing the mold or matrix, and operated from a distant point, which will be found of great practical utility." His hopes were not realized and no practical use was made of his invention.

This idea of typewriting and also of linotyping directly on a prepared paper matrix has been followed up by different inventors; as late as 1922 machines for this kind of work were invented and patented. It appears, however, that for many years to come such attempts will prove futile, because of the many billions of dollars tied up in equipment which hardly can be scrapped before such new ideas have been tried out in practice of a score of years and have proven beyond a shadow of a doubt the claims made for them by their enthusiastic inventors. Machines have been invented to do away with the use of type altogether, by punching the types on some substance which acted like a matrix and became a mold from which stereotype plates could be cast, for instance, punching upon teak wood. This process was impractical as it did not permit of correction.

J. G. Rivett, Mechanical Superintendent of the Western Newspaper Union, is the inventor of the Rivett patent flong machine. This machine produces in a continuous automatic manner, stereotype wet mats laminated in any number of sheets at one operation. It is capable of turning out from 300 to 400 completed wet mats per hour. This machine is made in various numbers of units to produce wet mats in any number or combinations of laminations. However, the price, between $5,000 and $6,000, has so limited the sale of

this machine that there are not more than five of them in use in the United States.

W. C. HANDLEY, New York and Cleveland stereotyper, is also the inventor of a wet mat making machine, and has sold many of his machines at about $1,500. With this equipment the roll must be re-run for each extra tissue. However, it produces a very fine wet mat and the price being comparatively low, more of these machines were in use at one time.

ZEB. E. AIKEN and FRANK L. RAINER of Tulsa also invented a wet mat machine embodying a plurality of bed rollers.

It would be going too far for the purpose of this booklet to record the many different materials matrices have been made of, especially so as no materials outside of clay, plaster of Paris and paper have proven to be of any practical value or to have been used outside of the foundries where they were invented.

Chapter Four

THE NEW ERA
THE DRY MAT, OR COLD STEREOTYPING PROCESS

Just as the deficiencies and shortcomings of the plaster of Paris process led to the invention of the papier-maché process of stereotyping, thus in due time the drawbacks of the latter made the invention of a better method a necessity. The quality of the work done by means of the wet mat method could hardly be improved upon, therefore the activities of practical stereotypers and inventors were directed towards obtaining equally excellent printing results, doing away, however, with the many drawbacks encountered in the use of the wet mat process.

The shortcomings of the papier-maché or wet mat method were few but far reaching. This steamtable, or hot process of stereotyping employs "wet mats" which are generally handmade in each plant from day to day; a series of special matrix papers and high grade tissues are pasted together with a mixture of flour paste and gum arabic to make these wet mats.

In almost every newspaper plant the preparation of wet mats and especially of such paste comes under the duties of the foundry superintendent, and these experts usually have their own special and jealously guarded "secret" paste formula. (Ged and Stanhope exercised the same secretiveness). There were, however, a number of printing supply concerns who made and sold secret pastes to the trade, under various names such as: pulchre paste, ivorite, nickello, electroline paste, etc., etc. It was to a certain extent due to this secretiveness practiced in practically every plant possessing a stereotype foundry that stereotyping was about the only phase of newspaper production which had not kept pace with 20th century progress.

Owing to the fact that all pastes used for the purpose of uniting the different paper layers of the wet mat have a tendency to sour and to mould, it is not practicable to prepare wet mats very far in advance.

Then again, uneven pasting as well as fermentation in the paste often causes wet mats to blister and blow up when they are molded and cast.

Deficiencies of the Wet Mat. To dry out the paste and the paper, the form of type with the wet mat, has to be subjected to a high temperature, generally done on a steam-table. It is obvious that the mat and the type cannot be separated until this mat has been thus hardened by heating and in this operation the type is necessarily heated also. It is in this particular that the main objection to the wet mat process exists, the heating of the type being a positive source of destruction to the type. When needed for "make-overs" for later editions, the superheated forms must be rapidly cooled, subjecting them to uneven expansion and then contraction, soon ruining even the most expensive foundry type.

The stickiness and bother of the "paste pot" work and above all the inhuman necessity of the stereotypers working in an atmosphere of intense heat, thereby endangering their health, are foremost arguments against the use of wet mats.

The comparative slowness of the wet mat process is also objectionable, in newspaper work, where the gain of time, after the copy is received, of preparing the matter for the press, is of greatest importance. Four to seven minutes of valuable time is consumed in baking the wet mats on the forms.

In spite of the fact that with the wet mat steam-table process of stereotyping such bodily inconvenience is suffered by the workmen, such invaluable time is lost, and great expense incurred, newspaper publishers have felt that as long as there was nothing thoroughly proven to be better, more rapid than, and still giving the same quality of printing obtained with the old wet mat process, they were justified in sticking to the old method, and in not discarding their steam-tables.

But in the meantime fertile minds were at work on the problem of making a matrix, eliminating the paste pot, the

steam-tables and their attendant vices, and saving invaluable time in the getting out of the daily newspaper.

The end result of all this labor and experimenting is the DRY MAT, ENABLING COLD STEREOTYPING. Up to the advent of the present day dry mats, about three years ago, dry mats were made upon a paper machine in one piece and not pasted together as is the case with the wet mat. They were beaten in with a brush in a cold state and no steam was used. Owing to inherent deficiencies of these dry mats themselves, the dry mat idea did not make converts very rapidly. Although very few foundries bothered to pet these dry mats enough to be able to use same, the idea was conceded to be a good one, the time saved also looked upon as a very favorable factor, but the ever varying thickness of the dry mat, the proclivity to blistering, buckling, chipping and pulling, the uncertainty of the proper humidifying, were not overcome until many years afterwards, and after innumerable experiments and setbacks.

DRY PULP FOR MATS

In 1863 the idea of using dry pulp appeared for the first time. This method of manufacture was not practicable, too difficult and these mats could not be made on a commercial scale.

The first attempt to use a dry cold process and to mold by rolling a mat only once was made by GEORGE EASTWOOD, of Kingston-upon-Hull, County of York, England, in 1887. It retained certain features of the wet mat but introduced the idea of a dry mat process, and should be designated as a semi-dry mat.

The text of the specification of the patent granted to Eastwood explains his process in the following manner:

"According to my invention I follow what is *practically a dry process* in the manufacture of the matrices, so that the heating of the type can be dispensed with, and I back up the blanks with sand during the ordinary process of warming and

drying the matrices, and I thereby obviate the liability of the blanks to become flattened by the pressure of the molten metal used in taking the castings.

"For the purpose of my invention I make a mold of two parts—namely, a facing and a backing. The facing is composed of two or more sheets of tissue-paper or other like material pasted together with a composition containing glycerine and a suitable starchy material, which composition keeps them in a flexible and elastic state, prevents the paper from becoming too hard before use, renders it sensitive to moisture, greatly reduces the contraction on application of heat and hardens the matrix or mold when heated. The backing consists of a dry thick sheet of soft paper, blotting paper, felt, or other like suitable substance capable of receiving and retaining an impression, and one side of which when used, is covered with a thin sheet of soft paper which is thinly coated on both sides with an adhesive material.

"In taking the matrix the facing is placed upon the type and the back of the facing is then covered first with a piece of muslin or other suitable thin textile material and next with a woolen or india-rubber blanketing, which (except when of India rubber) is preferably used warm. The whole is then rolled or pressed. This having been done, the blanketing and the muslin are removed and then the backing is placed upon the back of the tissue-paper that forms the facing. That face of the backing which bears the composition being put in contact with the tissue-paper, the composition on the backing should be nearly dry. The blanketing is placed upon the backing and the whole is again rolled or pressed. The matrix is at once formed and when removed from the type has simply to be warmed through to harden the composition."

"*Instead of the two rollings or pressings above described one rolling or pressing will suffice* if the backing be placed upon the facing, in the first instance, with the blanketing over them, the use of the muslin in this case being dispensed with; but a good result is not so certain."

This was the basic idea of a dry mat. It was not until

after six further years of experimenting that Eastwood invented a dry mat which was the *first* dry mat in the present day definition.

Shortly after Eastwood had made his first invention, FRIEDRICH SCHNEIDER and ARNOLD SCHOTT, of Philadelphia, in 1888 invented certain new and useful improvements in stereotype matrices. The invention was made to provide a mat from which an impression can be made *at any time in a dry state,* no drying or hardening being required, that would be so durable and strong as to resist the pressure of the quantity of metal on the blank spaces. To attain their purpose the inventors made a semi-dry mat. The invention consisted in a matrix composed of a sheet of fabric (cotton-batting, flannel, lint) coated and partly impregnated with a semi-dry plastic mass and provided with a backing of pulp. This plastic mass was made of glue, syrup, glycerine and a powder (alum, flour, chalk, asbestos-powder). This plastic was coated on a sheet of fabric and on this sheet another of very thin fibrous paper, for example Japanese vegetable-fibre paper, was placed. This mat is pressed upon the matter to be stereotyped and a sharp, clear impression of the type in the fibre paper and plastic is produced.

The matrix remains on the type and a sheet of wood pulp or any other pulp is placed upon the matrix, which sheet has been impregnated or saturated before being applied with a mixture of two parts of powdered dextrine, one part of starch, and one part of asbestos powder mixed with cold water and boiled and stirred until it has the consistency of cream. By re-applying the pressure the pulp is caused to adhere firmly to the matrix and to stiffen the same, so that when the hot stereotyping metal is applied it does not press down the matrix at the blank spaces. The matrix is removed and subjected for a few moments to a current of hot air for the purpose of hardening it. The improved matrix does not warp or shrink, and the impressions are not injured or marred by hardening the matrix. The inventors claimed that "by means of our improved matrix, stereotypes can be made very rapidly, as the

matrix need not to be dried on the type and the type and matrix need not to be heated, as has been necessary heretofore, while using composition or wet paper for stereotyping. There is not need of separately backing the spaces with plaster of Paris or compositions or cutting them out, as has been necessary heretofore."

"By using our improved matrix the type is not injured by heat as it is by the old method of stereotyping. As we do not heat the type no time is lost by waiting for the cooling of the type in order to procure a second or more moldings. A saving in time is effected, from 6-10 minutes."

INVENTION OF THE DRY MAT

The honor of inventing the first entirely dry mat and making a new product which constituted the basis of all later dry mats, belongs to GEORGE EASTWOOD, of Kingston, England.

There has been some controversy as to whether the Englishman Eastwood or the German Schimansky was the original inventor of the dry mat cold process of stereotyping. A careful examination of the English and German patents of these men show that Eastwood applied for his original patent on the 27th of November, 1893 (English patent No. 22732) and Schimansky for his first patent on the 28th of December, 1894 (German patent No. 86865).

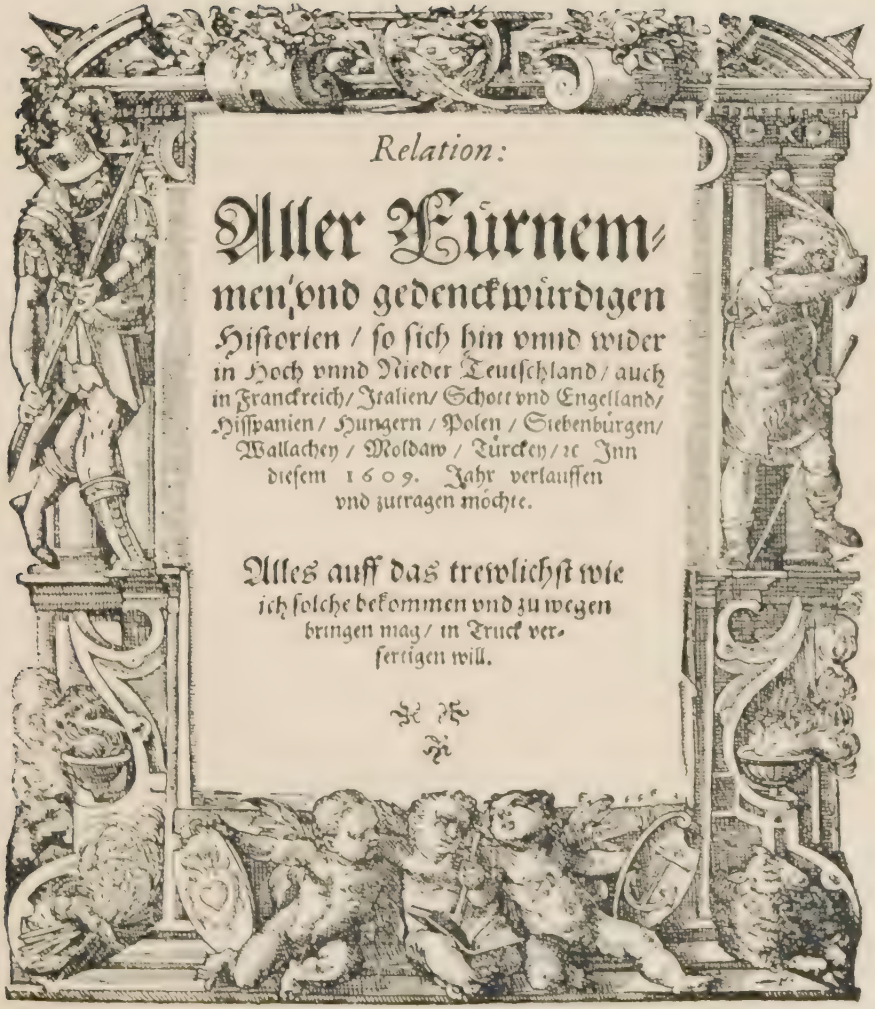
The former experiments of Eastwood on the subject of cold stereotyping, which led to the entirely dry mat have been described above. The text of Eastwood's patent is worthy of being recorded in full, being that his new matrix opened the new era in the art, *the era of cold stereotyping.* (Eastwood employs the Franco-English term "flong" in place of the general appellation "matrix" or "mat"). Eastwood describes his invention as follows; the brackets containing annotations of the author of this booklet. It consists in the manufacture of a flong from one thick sheet of blotting-paper or other bibulous paper faced on one or both sides when dry

with composition or paste. The invention also comprises a special composition or paste for the purpose, the said composition or paste being one that will dry, consolidate, and harden upon the surface of the paper.

In carrying out the invention, the composition or paste (coating) is preferably applied to the bibulous paper by means of a brush and in a warm state. *It is then allowed to dry, and when it is dry the flong is complete and can be kept in stock in the dry state for practically any length of time.*

"In practice I find it desirable to face both sides of the paper with the composition, because by so doing I avoid any tendency of the paper to warp while drying. It is also well to apply a second coat of the composition after the first coat is dry. When this flong is to be used, the face upon which the mold is to be produced is preferably smoothed with sandpaper; but this is not essential. This face is then slightly dampened with water or with the composition by means of a sponge or otherwise (humidifying) and it *may* then be covered with one or more sheets of tissue of other suitable paper, damp or dry. (At the present day many foundries in England still paste one tissue on dry mats, producing extra humidification through the wet paste.) Then it is preferably rubbed with French chalk or other suitable material which will absorb superfluous moisture. The flong thus prepared is placed upon the type or in a frisket or frame, and is then surrounded by heated air (a kind of scorcher) for a few seconds, so as to just soften the composition and render it plastic. When in this state it is pressed upon the form by means of a platen press. The mold is thus taken and becomes at once fixed.

It will be understood from the foregoing description that my flong is a *dry* flong with the composition or paste on the face. When the flong is used the blotting or other paper does not contain moisture, but the composition or paste, after being slightly dampened, as above described, becomes sufficiently softened (humidified) by the heated air or by contact with the form (when this is heated) to enable a perfect mold to be taken by the press. The special composition or paste which



Facsimile of Title Page of the First Newspaper (1609)

I preferably employ for facing the bibulous paper consists of treacle or other saccharine liquor, glue, flour, whiting, borax, and water. I do not limit myself to any particular proportions, but I recommend that the amount of treacle used should be about one-twentieth, by weight, of the combined weight of the other ingredients employed, exclusive of water."

Eastwood then describes in length the proportions of his paste. Eastwood's patent claims were:

1. A flong for producing matrices or molds for stereotyping consisting of a thick sheet of dry bibulous paper having on its face a dry composition, substantially as hereinbefore described.

2. A flong for producing matrices or molds for stereotyping consisting of a thick sheet of bibulous paper having a normal unimpregnated interior and having on its face a coating of a dry paste composed of saccharine liquor, glue, flour, whiting, borax, and water in approximately the proportions specified.

3. A composition for coating the bibulous paper of flongs used for producing matrices or molds for stereotyping, the said composition consisting of treacle, glue, flour, whiting, borax and water in approximately the proportions specified.

Thus, through Eastwood, the dry mat appeared upon the market. The first product was given to the foundries in England in 1887, and after having applied for his second patent, the new dry mat was introduced. American stereotype foundries learned of the new invention and in 1893 the "American Bookmaker" reported as follows: "From time to time during the past two years we have heard of the new method of stereotyping invented in England, and in which the matrix does not need to be dried off the type by heating the form but is removed while the type is still cold. The processes were kept secret, but they were understood to be the use of papier-maché not as wet as formerly, a different facing from any previously used and a current of cold air over the back. We hear that the results are by no means marked. The forms take

as long to be finished properly as electrotyping would require, the pages stand no more impressions than before and the plates are brittle. The requirements here are such that the greatest speed must be attained, and if there is a difference of one minute to each page by different processes this would be sufficient to throw out that which is slow."

Shortly after, it appears, that samples of the new dry mats were received in the United States, tested in several foundries and the following verdict arrived at in the same trade paper:— "The cold process of stereotyping from which much was hoped as a means of taking matrices for daily papers, does not seem to have yielded the results expected. The pages took a long time to make, were soggy and moist when the metal was to be poured in, and the generated steam beneath the hot fluid was often sufficient to injure the plate. It is to be hoped that some method will be devised by which the plate can be made quickly without involving the necessity of heating the type, which suffers thereby and becomes permanently lengthened, sometimes to the thickness of a cardboard. Otherwise the papier-maché (mashed paper or wet mat) process seems the perfection of simplicity."

In October, 1895, an American cold type stereotyping outfit (The Potter), was advertised in trade journals as ready for shipment, and a stereotyping expert stated that "now country printers can do their own stereotyping," meaning that the monopoly of making stereotype plates only in the large foundries in the big cities could be accepted as over and done with. "No beating of type to spoil the face, nor heating of type to make it soft and elongated. The molding is done on scientific principles and in about one-twentieth of the time required by the old papier-maché method. The manufacturer supplies the matrix, with full instructions for use. The form is laid on the molding machine, the matrix is placed on the form and by the rotating of a heavy iron cylinder the matrix is pressed into the form, and the mold is made. This mold is then taken from the form, placed on a hot plate to dry, and

is then put in a casting box, into which hot metal is poured and the cast is made."

THE GERMAN "POROSIN" DRY MAT

An advance step in the making of stereotype dry mats was made in 1895 by HERMANN SCHIMANSKY of Berlin, Germany. He contended that dry mats made in accordance with the specifications of prior inventors were so constituted that the free spaces were to remain white in the printing were filled up at the back of the matrix by covering with pieces of cardboard, as otherwise the hot lead would press down the very thin matrix in these spaces during the casting. Schimansky's invention (patented in 1899), was supposed to obviate this drawback and consisted in using perfectly dry matrices of vegetable fibre which were characterized by great porosity produced artificially, so that the impression of the type to be stereotyped takes place by simply destroying the porosity at the pressed parts, thereby rendering the mats directly suitable for the casting. Thus Schimansky claims he obviated the manipulation of covering up ("backing up") the free spaces, as his mat retains its original thickness at all free places which are not impressed. Schimansky recommends for the making of his mats all kinds of vegetable fibres—such as wood, cellulose, hemp, cotton or flax. In order to obtain the porosity of the mats, the inventor proceeded as follows: The fibres are first immersed in sodium carbonate and then in an acid, for example, vinegar—thereby developing as a gas carbonic acid, which effects the loosening of the mat. In this manner the porosity of the mat is obtained by loosening alone. Presumably the parts of resinous matter clinging to the fibre dissolve. In order to bend the fibre to form a mat, the fibrous material is treated in a long-sieve (Fourdrinier) paper-machine. Finally these mats are coated on one side with a thin coat or layer of starch paste, to which, five per cent of glycerine has been added, in order that the adhesion of the metal to the vegetable fibre may be obviated in the casting. *The matrix thus produced ready for use may be kept in stock in any quan-*

tities in printing shops and used at once when required. Schimansky gave his dry mat the name "Porosin Matrix."

All these improvements did not permit of obtaining a matrix of sufficient depth and faultlessly smooth surface, being that the Eastwood as well as the Schimansky mat did not possess a surface which could receive sharp and sufficiently deep impressions from the type without tearing. On the other hand, the mats were not firm enough to allow the formation of sufficiently deep interstices at the blank spaces of the type which could resist the pressure of the poured-in metal on repeated casting. Another drawback of these first dry mats was that the texture of the paper employed made itself appear on the cast mold.

Johann Egyd Weigl of Vienna undertook in 1901 to remedy these drawbacks by using a different process, which he claimed produced a plastic and impressionable dry mat, which would neither crack nor tear, and having a perfectly smooth surface. Weigl's mat was practically a wet mat, made almost identically in the same manner as a wet mat, namely by pasting different sheets and layers of paper together with different pastes, then drying same and stereotyping with this mat as per the cold process. The single sheets are thoroughly bound thru calendering and after drying form a single indivisible matrix. Weigl manufactured his dry mat by brushing a sheet of supple, plastic cardboard with a paste of vegetable glue, glue of albumen and alcohol to which was added glycerin and calcium chlorid, laying on a gauze-like fabric prepared in mucilage of gelatin and pressing thereover a sheet of unsized paper, the outer side of which unsized paper was coated with mucilage of carrageen-mass and albumen glue and pressing thereon several sheets of tissue paper. It is very easy to understand that such a manufacturing method would tend to make the price of the mat out of all question.

The patent rights upon the Schimansky invention were acquired and the manufacturing of such dry mats was carried on by a paper factory in Southern Germany. The results,

however, obtained in the beginning with the new dry mat did not warrant the making and selling of the product on a commercial scale. The factory simplified the manufacturing process, finally making a good dry mat, which it sold to German and foreign newspaper offices and which is still marketed as the "Porosin" mat. Schimansky's dry mat was adopted by the great German daily "Lokalanzeiger" of Berlin, and based upon this success, the inventor made a trip to the United States with the intention of disposing of his American patent. Several paper mills were more or less interested; Schimansky, however, returned home without having met with the hoped-for success.

RESULTS OF THESE DRY MAT EXPERIMENTS

Altho both Eastwood's and Schimansky's inventions were not satisfactory in a commercial sense, they certainly influenced a large number of paper makers to experiment with dry mat manufacturing and finally led to the excellent present day product.

Several German firms (Claus, Nietzsche, Benesch, Rosenthal, Geissler, etc.) took up manufacturing of dry mats as a side line in their paper mills and in due time the results of their pioneering work made the dry mat their principal product. For many years Germany was the only source of supply for dry mats, the product going to all countries in Europe and overseas.

The new dry mat process of stereotyping met with an attitude of watchful waiting on the part of the newspapers in the United States. As stated above, samples of these different European-made dry mats were tested in American newspaper offices but without arousing any enthusiasm or desire on the part of the stereotypers to adopt same in place of the well proven wet mat method.

In December, 1897, the "Inland Printer" reported on a new dry mat invention which later proved to be Schimansky's mat. It was described as a dry, spongy sheet of paper pulp

with a prepared surface on one side. This mat was molded under a mangle, perfectly dry, and then without being dried in any way, placed in the casting box, and supposed to be good for eight or ten casts. In 1899, Mr. Partridge, head of the stereotype department for the A. N. Kellogg Newspaper Company of Chicago, offered to send samples of this dry mat to stereotypers who were willing to try same, provided they made reports of their tests. In September, 1899, a number of stereotypers reported on their tests and the general opinion was that the mat was not satisfactory. In the first place, it could no be run dry, as it broke and could only give a very shallow cast. Some stereotypers tried pasting tissues on this mat when facing it, and in that way got fairly good results, but ran into trouble with shrinkage, etc., and found that these so-called dry mats showed no advantage over wet mats in labor or in saving of time. In 1899, the New York Tribune experimented with these same mats, and while they were able to mold them, were not able to produce casts that they could use.

In the same year it was reported from London that a "Dry Stereotype Company" was formed which claimed to have regular customers in England, but none in London proper. They claimed to have a perfectly dry flong which was ready for the casting box immediately after being molded, without drying in any way. It was also claimed that these same mats had been used in Berlin for a year. Again a search showed that the mat in question was the Schimansky mat.

American stereotypers and paper makers began their own experimenting in the dry, cold process of stereotyping, immediately upon the arrival of the European dry mats. The "Inland Printer" reported in January, 1894, on a new cold process of stereotyping, which was offered under the name "Multotyping". The inventor, a stereotyper (the name is not given), instead of using ordinary matrix papers used *asbestos paper*, which he claimed could be molded in a dry state, and placed in a casting box immediately after molding. However, all asbestos papers available had very rough surfaces, so that plates cast from such mats were not very satis-

factory. He therefore found it necessary to paste one or two tissues on the asbestos papers and to dry the prepared mat in a roaster. This stereotyper explained that it would no doubt be a very simple matter to find a manufacturer who made asbestos paper with a smooth face, and promised to report later on such sources of supply, but no further mention can be found of his process.

A dry mat method, which was supposed to do away with all auxiliary apparatus was invented in 1898 by Jose W. Phoebus of Wheeling. Phoebus constructed a one sheet or one piece dry mat. The face surface of the mat was coated with a sizing of diluted glue by means of a high-pressure spray and when dry was not more than 1/3000th of an inch thick.

This dry mat was used in an absolutely dry state, no humidoring, no wetting, hence no steam-table, no scorcher, no drier, in short a total absence of heat or moisture at any stage of the making of the matrix. Furthermore, Phoebus' invention provided means of molding the mat, whereby the pressure upon the type was delivered evenly throughout the entire form, the pressure being direct and gradual, (similar to the action of direct pressure molding presses) thereby avoiding such injuries to the type as were caused by ordinary brush beating or by the roller processes. Phoebus describes one of the apparatuses he uses for the molding of his bone dry matrices as a form of a press in which the pressure on the mat is secured by means of a suitable fluid under pressure, such as air or water. Phoebus uses as support for the chase with the tightly locked typeform a flat table. In connection with this table he employs a stationary slab which is hollowed out at its inner side to form the fluid chamber, which lies immediately over the typeform within the chase. The edge of the fluid chamber, formed at the inner side of the slab, rests directly on the edges of the mat, which overlaps the chase. The mat forms a gasket or packing between the contracting faces of the table and the slab, thereby preventing leakage of the pressure fluid at the points of contact. The type form is placed on the table, the mat placed thereover and the hollow slab is

clamped to the table. The fluid is then introduced under pressure thru a fluid-supply pipe fitted to the slab, communicating with the hollow fluid chamber and when compressed air is employed for mat molding, it distributes itself throughout the fluid chamber, exerts an even pressure over the entire upper surface of the mat, causing the latter to be forced into the type faces, thereby producing the mold. When this impression has been secured a cut-off valve in the pipe is closed, the slab removed and the mat released for immediate use. The molding can also be effected by hydraulic pressure thru the pipe into the fluid chamber, but in this case a rubber sheet is placed over the mat to prevent it from becoming damp.

FURTHER EXPERIMENTS

In 1900 FRIEDRICH SCHREINER, manufacturer of Stereotyping Supplies in Plainfield, New Jersey, offered matrix paper for "cold type stereotyping". To quote his prospectus: "Our Patent Cold Process Matrix Paper consists of a Plastic Face Sheet and a gummed Back Sheet. In making a Matrix the back of the Face sheet should be rendered moist with a wet sponge and then as soon as the sheet feels soft it must be beaten in slightly with Brush, it may also be pressed in or rolled in. Then the gummed side of the Back Sheet is rendered wet with a thin paste and with the coated side laid upon the already beaten Face sheet, and united to the same by beating, or pressing, or rolling in. Then the Matrix is lifted from the type form and dried upon a hot plate". This mat paper was designated a "cold type matrix paper". It was used by a few stereotypers for base-ball starters, but with the advent of the German dry mat, Schreiner's matrix disappeared from the market.

Since the beginning of this century, very few new inventions pertaining to the art of making matrices have appeared. Two developments merit being mentioned.

In 1911 NIELS BENDIXEN of Copenhagen invented a method of producing a special rapid drying mat for stereo-

INTERIOR OF A STEREOTYPING FOUNDRY IN 1830

typing of half tones. Bendixen made from a photograph an etching, coated it with a fatty paste containing paraffine, fish glue and pipe clay. A wet mat made with another special soapy paste was placed on top of the coated etching, covered with blotting paper and placed in a heated drying-press. The coating on the etching loosened itself from the etching and adhered to the paper mat, transferring to the paper all the details of the etching. In this manner a paper mat was procured, which was flexible, and adapted to be sent by mail and wherein, immediately after its production, one or several castings could be made, using stereotype metal.

The distinguishing feature of Bendixen's matrix was that it possessed the quality of drying very rapidly. The ordinary dry mat is much cheaper, simpler and better adapted for syndicate work.

A novel altho commercially not applicable departure from the hitherto universally used method of making dry mats was invented in 1912 by GLENN S. WILLIAMSON of New York. In his specification Williamson states that matrices have been heretofore molded from paper or other suitable fibrous material, previously impregnated with such condensation products of phenols and formaldehyde as may be rendered infusible by heat, the condensation product being transformed during or after the act of molding into hard and infusible condition.

Williamson finds that matrices of the above general character may be rendered more resistant to the effects of molten stereotype metal at high temperatures, by using in conjunction with above named phenolic condensation productions, certain structureless salts or compounds (silicates of alkali metals and the corresponding aluminates), which although soluble in water are refractory at the casting temperature of stereotype metal, say 550° Fahrenheit.

His procedure consisted in impregnating with the described liquid condensation product then baking for an hour at about 70° Centigrade. The sheet is then dipped in a fifty per cent. solution of sodium silicate, thoroughly dried at

normal temperature and then baked for fifteen minutes at 70 degrees. The sheet is then faced with thin paper, as for examples sizal paper, pasted on with sodium silicate solution, and is also backed with from one to three sheets of similar light, strong paper, also applied with sodium silicate solution. The compound sheet thus prepared is then dried and molded. Sample matrices prepared by the above methods withstood the action of type metal introduced under pressure and at temperatures of 550° F. or upward, without necessitating extensive so-called "backing-up" which has for its purpose the reinforcement of the blank or projecting areas of the matrix.

During all this period dry mat manufacturers experimented on the simplification of manufacturing their product. The resulting methods have remained secrets of the individual factories.

To make dry mats by hand instead of on a paper machine was tried and the procedure generally followed was to use a hand sieve, scoop up the pulp, shake same, thereby felting the pulp. The material was then mixed with an alkaline solution and thereupon the sieve holding the sheet was dipped into an acid. This freed a great amount of carbonic acid, which inflated the sheet which was dried in the open air or in lofts. This method was too slow and too costly to be commercially practiced.

An experiment was a method of stereotyping designated as "Graphotyping", a process of coating a plate with a mineral substance bound with glue, producing a film and after this film was hardened, it was coated with a fatty, resinous pigment and the interstices were deepened thru brushing same with water. For the printing of music, so-called Pyrostereotyping was practiced. The characters were burnt in wooden plates with a heated steel tool and then stereotyped in the usual way; or a machine, similar to the modern sewing machine with a heated needle was used. Other innovations that appeared in the course of time were known as Lot-

tinography, Monotyping, Cellulotyping, Cellography, Ikonography, Tachytyping, Gelationography, Photostereotyping, Gypsography, etc., etc.

THE INTRODUCTION OF THE DRY MAT IN AMERICA

It is interesting to follow the development of the dry mat method of stereotyping in America. In 1901 FERDINAND WESEL of New York, veteran manufacturer of stereotyping machinery, was in London, where he found newspapers using a German dry mat quite successfully. Wesel went to Germany and there secured the sole sales agency for America of these dry mats. The Wesel Company introduced the mats into America, but had very little success with them because of opposition on the part of stereotypers, and because the results were not what they had expected. About the only use of these mats was for baseball starters. Later on, the Wesel Company sold their agency to the Pittsburgh "Press". Here the stereotype-foreman, ALFRED BIRDSALL, started his experiments in dry mat making. The mats not being coated, the face was uneven; Birdsall attempted to remedy this drawback by pasting one or two tissues on the dry mat, but this method did not meet with success. In 1910 Birdsall invented his own coating, started a "Dry Mat Service Co., Ltd.," in Pittsburgh and in 1912 advertised that over 50 newspapers in the U. S. A. were purchasing the new dry mat. With the advent of imported coated dry mats no more was heard of the Pittsburgh mat.

The American Type Founders also imported and sold mats for a short time, the price asked for one dry mat of newspaper size being $1.00.

In 1907 practically all newspapers in Germany went on dry mats, using a toggle-press instead of roller to make the molds.

In 1908, the mechanical superintendent of the "Daily Mail" in London CHARLES F. HART, the present mechanical

superintendent of the New York "Times", advocated the use of dry mats for all newspaper work. The "Daily Mail" was the first daily newspaper in Great Britain to adopt dry mats exclusively, using the imported German "PADIPP" mats made in Dippoldiswalde, Saxony. Indirectly thru Mr. Hart's endeavor to have an English manufacturer provide English products to an English newspaper, JOSEPH DIXON, paper maker of Liverpool, engaged in the manufacture of dry mats as a side line, marketing his product under the name "Dixotype" mats.

In 1909 HENRY A. WISE WOOD of New York visited the plant of the London "Daily Mail", where the working of German dry mats was shown him. Wood decided to engage in the dry mat business in the United States and some time later made an arrangement with Gerald Wetherman, agent for the "Padipp" mat in England, for the sales agency of this German dry mat in America. Wood continued the sale of this dry mat until the World War made imports from Germany impossible.

In April, 1913, CARL RAID founded the "Flexitype Company", Cleveland, Ohio, sole agents for the German "Flexitype" dry matrix, which was manufactured in Saxony. JOHN BREUER, stereotyper and demonstrator of this new dry mat, invented the necessary equipment for handling these dry mats, namely a scorcher and a humidor.

Within a year's time many newspapers taking 3-5 casts from a mat had been won over to these dry mats exclusively. The advent of the World War ended the contracts and after disposing of its stock of mats the company went out of existence.

The World War having put an end to the business of importing German dry mats into America, BENJAMIN WOOD, convinced of the fact that the dry mat was here to stay, decided to engage in the manufacture of this product. With the aid of American chemists, in whose experimental laboratories all makes of dry mats were analyzed, a dry mat

manufacturing process was found and in 1917 Wood, as first in the United States, began producing dry mats on a commercial scale. His products are sold under different names such as: Metropolitan, Marathon, Speedmat, Standard, etc.

After several years spent in Europe learning all details of a number of dry mat manufacturing processes and also of dry mat stereotyping methods, GEORGE A. KUBLER of Akron, Ohio, founded in 1924 the Certified Dry Mat Corporation, New York City, for the manufacture and sale of dry mats, making only one brand known as "Certified" Dry Mats.

A number of other American manufacturers experimented in the making of dry mats; they encountered innumerable difficulties and after having sacrificed considerable sums of money abandoned dry mat manufacturing entirely.

In concluding this booklet a few remarks on the present day dry mat and the equipment employed in the use of same are in order.

PRESENT DAY DRY MATS

Present day dry mats are integral homogeneous units, delivered in sheet form of one standardized size, twenty by twenty-four inches. They are made in any thickness between the limits of twenty-four thousandths and forty thousandths of an inch to meet the preferences and needs of stereotypers under varying conditions, and for use in all kinds of equipment. They are not laminated or pasted together and hence cannot blister or blow up; neither do they deteriorate either before or after molding.

By their very nature dry mats at once eliminate one phase of drudgery in the foundry—that of paste mixing and pasting wet mats. Dry mats are delivered in standard cases containing five hundred mats, wrapped in waterproof paper. In extreme emergencies the mats may be used just as received—right out of the cases, but in every day practice and for uniformly good results they require a simple process of conditioning.

To properly condition dry mats, they should be placed, preferably in a heatless humidor for from twenty-four to forty-eight hours, depending upon conditions prevailing in each plant. It will require a little experimenting on the part of the stereotyper to determine just how long to keep the mats in the humidor so as to get the desired results as to shrinkage as well as the proper depth in molding.

Those who prefer to steam their mats in humidors may do so without any harm to the mats or to results. However, with a perfect dry mat all heat should be turned off. Good dry mats absorb all the moisture they need from the humid air caused by the evaporation of the water in the pan at the bottom of the humidor. Whether dry mats are steamed or not, from the humidor they should be seasoned in storage boxes for from at least five to ten days. Consistently conditioning and seasoning dry mats insures even distribution of the moisture put into the mats, means even depth in molding, and consequently good printing plates. Experience in many hundred newspaper plants have conclusively shown that those who condition their mats consistently are the ones who get uniformly good printing results.

Halftones should be underlaid with one layer of newsprint paper so that they are four-thousandths of an inch more than type high. For taking the impression, the conditioned mats are imposed on the forms face down, and a molding blanket (either cork or felt: some stereotypers prefer two blankets, both cork or one cork and one felt) placed on top. The mats on the form are rolled one way (but once), the stroke of the roller bed being from twenty to thirty seconds; the slower the better. The mats are then removed from the forms, and the forms do not enter into the process any further.

The molded mats are now "backed up" with felt packing in the particularly open spaces, and in the same way as the old wet mats. This is done so that the mats can withstand the force and weight of the metal in casting the plates, as otherwise the mats would give way in these open spaces and

cause smudges in the printed pages. After they are "backed up", the mats are thoroughly dried in the roaster or scorcher from one-half to one minute. A thorough drying is essential and prevents many of the troubles which stereotypers otherwise encounter in their work. Once the dry mat has been impressed, the form no longer enters into the process. The forms have not been heated in any way, nor have they been subjected to any pressure other than that of the mat roller in molding, and are therefore immediately available for re-make or other disposition. Since the molded mats are still moist, they must be thoroughly dried preparatory to casting, as otherwise the heat of the metal in casting the plates (generally from 600° to 650° F.) would create steam which would repel the metal from the mats and cause imperfect printing plates. This drying of the mats is done in the roaster or scorcher, which at the same time helps shape the mats to conform to the curvature of the cylinders of the printing presses.

During this drying period the dry mats shrink so that without altering present make-up in any way it is possible to print on narrower paper. With dry mats manufactured in the right way this margin of shrinkage is constant and uniform, and is always under the control of the stereotyper. The normal shrinkage of dry mats should be one-quarter of an inch in width of an eight-column twelve and one-half em page, such shrinkage being usually obtained by twenty-four hours of humidoring. In length of column the shrinkage is usually one agate line but never over two agate lines. When the stereotyper works out these details, such as length of time in the humidor and storage box, and follows them consistently, the shrinkage is always under his control and is constant and uniform.

The shrinkage in width of page is utilized by publishers to save worthwhile sums on their bills for newsprint, without altering present make-up or changing present margins. For example, a paper of eight columns twelve and one-half ems, instead of printing on seventy-two inch rolls, as with wet mat

stereotypes, can be printed on seventy-one inch rolls with dry mat cold process stereotypes. This saving of approximately one and one-half percent of newsprint applies to all roll widths, and to all standard size newspapers.

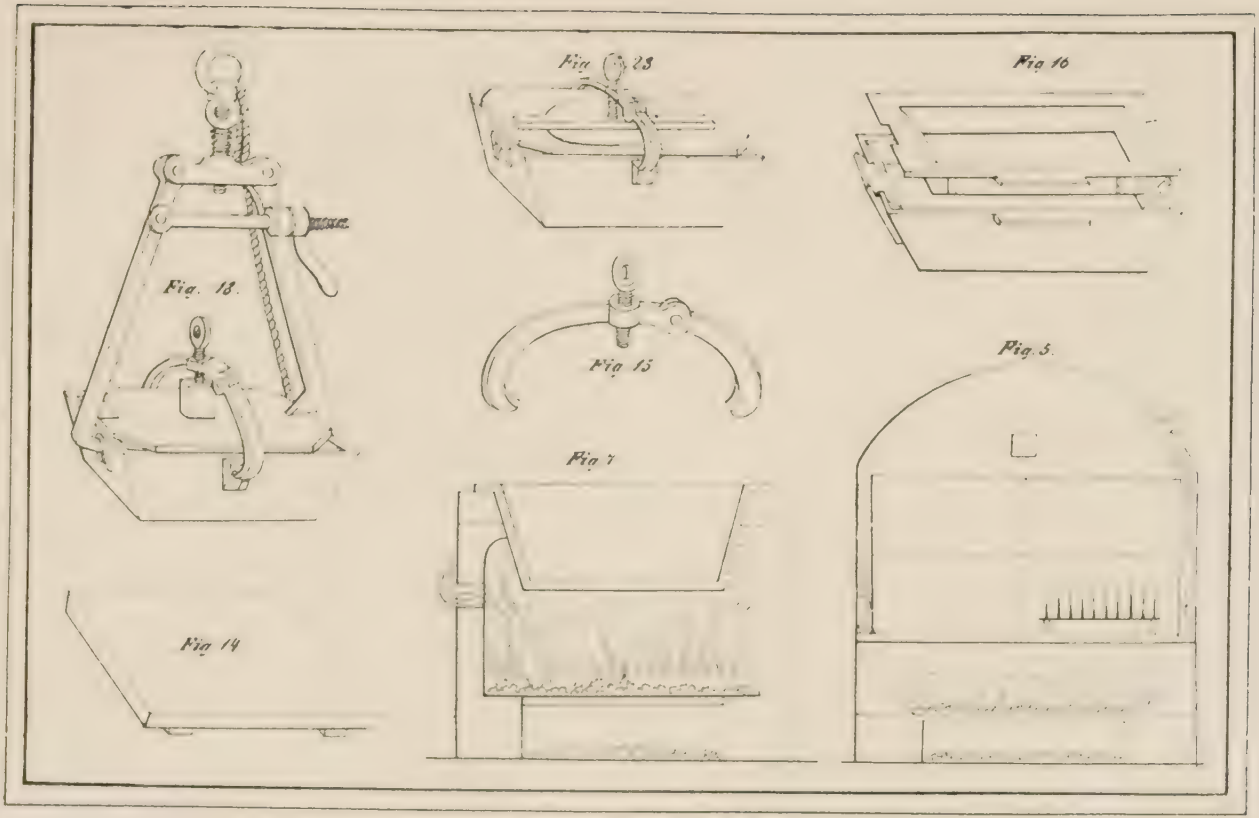
Where shrinkage in length of column is objectionable because of advertisers' complaints, it is a simple matter to allow for it in the composing room by setting up two additional lines; that is, by making the composition "strong" to the required extent. Since many large dailies now have to make their advertisements "strong" even with wet mats to allow for the shrinkage in the wet mats as well as in the plates themselves, it is no problem whatsoever to allow for the additional shrinkage with dry mats. If a dry mat is properly made, the shrinkage is uniform and it is a simple matter to allow for it.

One of the factors which has mitigated against the more extensive use of dry mats in the past, has been the fact that this shrinkage in width as well as in length of column, was not uniform, and therefore has been the cause of a lot of trouble in the mechanical departments, as well as with advertisers. With good dry mats the cold process of stereotyping has been rid of this bugaboo, and publishers no longer have any troubles on that score.

Then again, shrinkage in length of column is not altogether a disadvantage. In fact it may be taken advantage of and prove a blessing in disguise. It permits of printing two extra lines on the editorial and magazine pages, and particularly on the classified pages, where the rate is generally so much per line, without increasing the actual size of the pages.

The economy as well as the facility of cold stereotyping is not attained at the sacrifice of good printing. This is borne out by the experience of many hundred newspapers throughout the world.

However, facility is not the only virtue of *cold* stereotyping; together with facility and simplicity there is genuine economy of time and money.



STEREOTYPING EQUIPMENT USED IN 1830

For example: A newspaper using 1,500 tons of newsprint annually spends, yearly, for dry mats,

9,000 mats @ 15c a mat—$1,350	
Saves, yearly, the cost of wet mats, labor and material (at least) 9,000 mats	$1,080
1½% of newsprint used (1,500 tons at $75 per ton delivered)	1,687
Cost of operation and maintenance of steam-tables	1,000
Cost of drying blankets	100
Total gross saving	$3,867
Less cost of dry mats	1,350
Shows a net saving, of approximately, annually	$2,517

(The cost of cork and/or felt molding blankets for dry mats is offset by the cost of similar blankets for wet mats).

The figures in the table are based on data that has been furnished by publishers from all parts of the country, and of newspapers of all sizes. As a rule of thumb, the operation of steam-tables per year is one dollar for each wet mat used a month. Thus a paper using only five hundred wet mats a month spends approximately $500 per year for its steam-table maintenance; a paper using 3,000 mats a month spends $3,000 a year, etc.

In sections of the country where natural gas is available for generating steam the above costs may be high, but as a general proposition these figures are conservative.

A PERFECT DRY MAT

A perfect dry mat must have the following properties or characteristics:—

(1) It must always be of the *same thickness*. This means that not only must all the mats in any given lot be uniform in thickness but that from lot to lot, the mats must be the same

And it is particularly essential that each mat be of uniform thickness throughout, in other words when measured with a micrometer at the corners or in the center or along the edges, the thickness must be the same.

(2) It must always be a *completely finished* mat, which means that it must be coated before leaving the factory, thereby eliminating all necessity of applying coatings, oils, fats, gasoline, etc., in the newspaper foundry.

(3) It must have a smooth *glass-like* surface without any trace of fiber or web marks. This smoothness of surface must not be accomplished through calendering to such an extent as to make the mats too hard. The harder the mat, the more pressure needed in molding it and more danger of breaking the type. The mistake is often made of calendering the mat until it is hard as iron in order to give it a smooth face and to be able to claim that it can be used with less backing. While less backing means somewhat less work, this slight saving of labor in the stereotype department is more than offset by the loss incurred by ruining expensive case type, and is entirely out-weighed when poor printing results through missing letters that have been forced down under molding pressure is considered. In the perfect mat, smoothness of face is achieved in a natural way in the machine during the process of manufacture. In any case, calendering is deleterious; glazing the mat should be all that is necessary.

In the matter of "stay back", manufacturers in all countries where dry mats have been and are being made have tried to make dry mats that would require little or no backing. To date none of these experiments have been successful and manufacturers are back to where they started. Experience has shown that any slight advantage through saving of labor obtained with a mat that requires less backing is out-weighed by the disadvantage of ruining type, extra fuss in the handling, and above all, in poor printing plates produced.

(4) The fibers of the dry mat must be *lightly felted* and interwoven on the machine, thereby giving flexibility, elasticity, and tensile strength; they must not be compressed.

(5) Perfect mats must be loft dried, a very expensive method but the only one to get the best to the user.

(6) A dry mat must be the product of meticulous care in the process of manufacturing, of absolute cleanliness in the factory, as the smallest particle of grit will spoil the finished mat.

In summing up, the perfect dry mat must have all the advantages of its mother, the wet mat, excel her if possible in any particulars, and inherit none of her drawbacks.

STEREOTYPING EQUIPMENT

In completing this booklet, we come to the equipment necessary to handle the present day methods of stereotyping. The plaster pot disappeared when the Frenchman Genoux invented papier-maché mats for stereotyping, and the paste pot and steam table began their journey to ultimate oblivion when the dry mat cold process was invented. The brush beating of mats by hand was temporarily displaced by the brush beating machines invented and built by Partridge in Chicago in 1899 and by Derriez of Paris in 1900, and then this antiquated method gave way to the roller or mangle method of molding mats.

A brief outline of the development of stereotype equipment and a description of modern dry mat cold process machinery which a foundry must have, follows:

A Dry Mat Humidor. This device was not known in the use of the plaster of Paris and wet papier-maché mats, these being moist or wet matrices. The advent of the dry mat necessitated the invention of the humidor or moistener. The first and basic patent taken out on a humidor was granted to J. Fremont Frey of Indianapolis in 1913. His specification states that his device is to be used for conditioning (moistening) and thereby making dry mats softer and more plastic, in order that they take the type impression more readily and accurately and with greater depth.

Frey's humidor is a galvanized iron box, closed airtight,

On the inner surfaces of the vertical walls there are provided a number of vertical guide-ways opening at the top but partially closed at the bottom. These guide-ways or slots receive moisteners in plate form made of a special kind of clay, which absorbs water easily and allows it to evaporate readily. The humidifying of the mats which are placed in a rack or frame in the center of the humidor, is a uniform one. Frey uses no heating device, the moistening being effected by cold water.

The John Breuer humidor is constructed of either galvanized iron or copper. From a receptacle on top of the humidor water is fed to mineral slabs or blankets, which line the walls, by means of wicking enclosed in lead tubes. Later imitators advocate the use of gas or electric heat, so-called hot water moistening.

Moistening Machines. A very recent invention is the dry mat moistener. This is a precision machine which moistens the backs of the mats more evenly than is otherwise possible. The mats treated in this way need be seasoned for only two or three days.

Storage or Conditioning Boxes. These boxes are made in different sizes, the best adapted ones are of galvanized sheet iron, measure 26½x22x6½ inches (inside measurements) and hold one hundred humidified dry mats. The mats remain in the boxes from 5-7 days in order to evenly distribute to each and every mat the moisture taken up in the humidor.

A Dry Mat Roller or Mangle. The older types of mat rolling machines were designed to facilitate the handling of wet mats, thus eliminating the extremely slow process of beating in with the brush. These older machines were operated at one speed only, were usually driven by a single upper rack, the mats being rolled twice, once forward and then back, and used only on wet mats. With the introduction of the cold dry mat process, however, difficulty was experienced with machines of the old design, as the speed at which they usually were operated was too great to give proper results when this method of molding was employed. Also,

owing to the different texture of the dry mat from that of the wet mat, and the fact that the gears and upper rack were thrown slightly out of pitch when in operation—thus causing the machine to develop lost motion—there was a tendency to break off letters where parts of the face overhung the type body.

The newest type of roller is equipped with a variable speed motor, which is instantly adjustable for rolling in either wet or dry mats. Many of the existing wet mat rollers can be altered to accommodate dry mats. The general time of travel in one direction of the roller for wet mats was 5 seconds, for dry mats it is from 15-40 seconds. The makers of rollers are Duplex, Goss, Hoe, Scott and Wood. Another means of molding dry mats is the direct pressure molding press, which is now used in great numbers in Europe. (In 1920, for instance, Germany had 118 direct pressure molding presses and 197 rollers). These presses are now being introduced in the United States. The first hydraulic press was built in 1911 by Rockstroh and Schneider; many different systems followed their example. The presses built in this country are the Birotadruck and the Hoe, both introduced during 1926.

A Dry Mat Scorcher or Roaster. A scorcher is a device used for thoroughly drying molded mats by evaporating the moisture out of them preparatory to casting the stereotype plates. Every kind of mats must be dried, thus plaster of Paris mats, clay mats and wet mats were first dried in kilns or ovens, then on hot plates, in flat driers, on steam-tables or on the Pape or revolving scorcher. The Pape wet mat drier was invented in 1885 by an Italian master stereotyper of the "Daily Telegraph" in London, and was the first of its kind. With this machine the matrix is dried by a rotary motion, hot air and steam working in unison.

The steam-table was most probably invented in 1856 by the Dellagana Brothers of London. The first reference to steam-tables in the United States dates back to 1861 at the New York Tribune. Here Craske and Collins were experimenting with papier-maché mats. The story has it that the steam-table

was installed in the room directly above Horace Greeley's office and that due to a leak, hot water dripped through and scalded the famous editor's bald head. Mr. Greeley was so put out that steam-table operation had to be suspended for several months. Mayall and Hartnet of Boston in 1874 invented a combined steam-table and steam jacketed drying-oven, to cut down drying time from 13 minutes to less. Pearce and Hughes of England in 1880 invented a new method of drying a mat by removing the mat from the face of the form while it is in a moist condition and then confining same between a layer of heated plate and blankets with a perforated flat plate on top. In United States patent No. 128285 a method is described in which the matrix is removed from the form while still in a moist condition, and laid back downward upon an iron bed, its face being then covered with a layer of sand which filled all the intaglio parts of the matrix and served the same purpose as the type in preventing the face of the matrix from becoming distorted during the drying operation which followed. The use of sand in this manner is objectionable, because it is sure to adhere, to a greater or lesser extent, to the face of the matrix, so that its removal therefrom after the matrix is dry requires some time and labor, and the element of time is, as is well known, of the greatest importance in the operation of stereotyping. The present day dry mat scorchers are the Hoe, Goss, Scott and Wood semi-circular, the Duplex tubular (upright), the Wesel rotating, the Breuer flat, 1895, the Winkler centrifugal, and others.

From the roaster the mat is taken to the Casting Machine. There is no difference in these machines as far as casting from wet or dry mats is concerned. The machines consist of two parts, the melting pot and the casting boxes proper. The old-time melting pots, from which the metal was scooped with a ladle, was supplanted in larger establishments by the metal pumps, which were built into the metal pots, some holding up to 10,000 pounds of metal, or made in one piece with these pots. The heating was done with coal, later on with coal, gas, press-gas and electricity.

View of a Modern Stereotype Foundry

The slowly working hand casting boxes are still in use in small foundries, but have made way for AUTOMATIC PLATE CASTING MACHINES in larger newspaper plants. Of these latter there are two systems, the vertical and the horizontal machines. The vertical ones still retain the so-called tailpiece, whereas the horizontal ones have no tailpiece. The automatic casting machines are either semi-automatic or entirely automatic. With the former the casting is done by hand, the subsequent treatment, however, is done automatically by means of different mechanical steps. The first machine of this kind was the "Citoplate" invented and manufactured by C. E. Hopkins and Ferdinand Wesel, both of Brooklyn, N. Y. Then came the "COMPLEO" caster, made by Koenig and Bauer in Wuerzburg: then followed the Hoe, Duplex, Scott, Goss and the Autoplate Junior casting machines. Another semi-automatic casting machine, now obsolete on account of the sensitiveness of its mechanism, was the "ROTOPLATE" invented by Egli.

Entirely automatic casting machines are: The STANDARD AUTOPLATE, invented by Henry A. Wise Wood of New York in 1900 and first used at the "New York Herald". With this machine the operation of casting is performed automatically from the time the mat is put in position until the finished plate is ready to be clamped to the printing press. In lieu of the six men hitherto employed, three men produce four plates per minute. The casting is done against a horizontal cylinder or core, the interior of which is cooled by water. Below it is a frame or "bask" carrying the mat. This back has an up and down movement of about six inches, and when it is in its top-most position there is a semi-circular space between it and the core equal in length, breadth and thickness to the plate which is to be cast. Molten metal having been injected into this space by a pump, there is a pause of a few seconds to permit of solidification, and then the back falls, bringing away the mat for another cast. Immediately afterwards the cylinder makes a half turn and presents what was previously its upper half to the mat for another cast. The first cast is taken with

it as it turns, and is then pushed along from the top of the core against two rotating saws which trim its edges. Next it comes under a shaving arch, where it rests while its interior surface is smoothed to proper thickness and finally water is directed against its back to cool it without wetting its printing face. The Autoplate Junior is a semi-automatic plate casting-machine. The casting is done against a vertical cylinder or core, whereas in the Standard Autoplate the casting is done against a horizontal core. The Junior Autoplate has been found more practical and has supplanted the Standard machine.

Another completely automatic plate casting machine is the "MULTIPLATE" invented by Annard and built in England. This caster has a pump which is similarly constructed as in the Autoplate Standard. The machine is also a horizontal one, but the core is so made that it contracts under pressure. It takes the plate out of the casting receptacle or bowl into the boring, which then takes the plate to the part of the shaving bowl by means of an endless belt and deposits it upon a table.

A new development in the automatic casting machine field is the "WINKLER" Patent automatic plate casting machine. It is built in Switzerland and in Germany. A factory in the United States is now reported to be building the machine for the American trade. This machine embodies a number of patented features and new principles, which permit the production of perfectly true and solid stereotype plates: without "tailpiece"; without pumps; without subsequent shaving; without trimming or handfinishing. In other words: after a short automatic operation, a perfectly finished stereotype plate is produced, which is absolutely ready for the rotary press. The fundamental idea in designing the "Winkler" casting machine was to directly connect the casting box with the melting pot, in such a way that the stereotype plate is cast without a tail but under the head of the whole contents of the metal pot, by gravity, that is to say, at a pressure most suitable for obtaining a perfectly true and solid plate. The machine consists of: (1) a melting furnace, (2) a hood with self-closing door, (3) one valve with automatic lubrication, (4) one

pyrometer, (5) one enclosed driving gear with motor and starter, and one casting box comprising: one casting shell, one core, one matrix clamping device, two rings and an automatic water-cooling arrangement for shell and core. The operation: only work done by hand is: setting the matrix (once only); starting the machine by foot pedal; removing the finished plate; everything else being done automatically by the machine. Other claims for the machine are economy of metal, economy of fuel (50% saving), low casting temperature, higher output, less floor space required, and the use of exceptionally hard metal.

Other auxiliary machines used in stereotype foundries are: the combination saw and trimmer or similar individual machines used for sawing and trimming the plates. Routers for removing any protruding pieces of metal on the stereotype plate that might take ink and print. Shavers which smooth the interior surface of the plates. Bevelers, which form the bevels by which the plates are clamped to the presses. It goes without saying that all of these auxiliary machines as now used in stereotype foundries have in the course of time been simplified and improved.

THE FUTURE OF STEREOTYPING

In Europe about ninety percent of all book printing and plate making is done by stereotyping and only about ten percent is electrotype work. In America the reverse is the case. In Europe practically all newspapers that stereotype are using dry mats; in America it was only about two years ago that the dry mat cold process of stereotyping began coming, slowly but surely, into its own. There is hardly any doubt that what prevails on the other side of the Atlantic will, in the not all together too far off future, prevail in America. There is still open a very large field for stereotyping, namely color printing, and book and magazine printing from stereotype plates. When stereotyping was invented, many of the finest books were printed by that means, and it appears that the same con-

dition will prevail again, as the art of stereotyping advances and the best kind of printing will be achieved with stereotypes.

HENRY BEAMISH in "Wesel Topics" writes as follows: "Publishers know that the public will refuse to go beyond a certain figure in purchasing a popular edition. Raise that figure and the printing 'goes dead.' Recently, a large edition of a scientific work was published and sold at an excellent price. Apparently, the market was then saturated but a lower popular priced edition of a hundred-thousand was later printed, against the advice of many. But the entire hundred-thousand was sold almost immediately.

Recently, much agitation arose over the exorbitant price of books,—a decided disadvantage for both the publisher and the reader. It was pointed out that one of the ten best sellers, as a matter of fact, did not sell successfully in its first high-priced edition, and never became a best seller until published in a popular lower-priced edition.

'But', the printers contend, 'books cannot be produced at a lower price.'

At least a half-dozen of America's largest book printers are reducing book production costs by adopting stereotype plates for even the highest quality editions with commendable results. Stereotype book plates have been successfully used in England for some time, with a resultant decrease in production costs.

Careful and extensive examination of various high quality editions printed with stereotype plates, has proved conclusively that the results are equally as satisfactory as any other method. The reluctance to adopt stereotype plates for high quality books has been merely a question of tradition,—the old contention 'that it has never been done before.'

As for advantages of mechanical production, they are largely obvious. Considerable press time is saved, running into thousands of dollars on large editions. Make-ready costs are appreciably reduced, and the resultant saving deducted from the production cost. Savings in metal costs are quite

extensive. After the edition has been printed, the stereotype metal can be remelted and the matrices saved for the next edition. The saving in storage space is tremendous. The space required for the electrotypes of a single book is sufficient for storing the stereotype matrices of fifty books,—a worth-while consideration in a large publishing house.

At the height of a press run, time is extremely valuable. If a plate becomes accidentally battered or damaged, a new stereotype can be made in five minutes and the run resumed, as against anywhere from twenty minutes to four hours to produce the same plate by electrotyping. Ordinarily, good-quality stereotype plates render excellent results up to 50,000 impressions; if longer runs are required, nickel-faced stereotypes can be used."

The clay and plaster-of-Paris methods of stereotyping dominated the field for over one hundred years; the wet mat stereotyping process, due to celebrate its centenary in 1929, is still in great vogue. The infant among the matrices, the dry mat, is firmly implanted and promises to supersede its parent and grand-parent. The American master-stereotyper is well aware of the fact that stereotyping is an art as worthy of consideration and esteem as are the many arts of the graphic industry, and he knows that the sum-total of all of the above recited laborious experiments, and the brilliant successes achieved by his ancestors in the craft have given to the art of printing an indispensable link, without which a modern printing establishment cannot be imagined.

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